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CONTENTS

Volume 3 February, 1934 Number 2

The Importance of Psychology, by Richard Stephen Uhrbrock 61
—Its Bearing on the Efficiency, Well-Being and Happiness of Employees—

Compensation In Denmark 72

Dislocation of the Patella, by Geo. G. Davis, M.D. 73
—Rather Uncommon in Industry, but Important Enough When It Occurs—

Seven Wonders of Medicine 76

Oblique Hernia and Workmen's Compensation Laws, by Robert M. Toll, M.D. 76

Derangement of the Semilunar Cartilage of the Knee, by E. B. Mumford, B.S., M.D. 78

Health Insurance 82

Cardiovascular Disease and Industry, by Nathan Smith Davis, III, A.B., M.D., F.A.C.P. 83
—VII. Trauma; and VIII. Etiology of Heart Failure—

Workmen's Compensation, by Thurman H. Lautenschlager, M.D., LL.B. 85
—A Complete Study of the Subject with Special Reference to its Medicolegal Aspects—

The Practical Value of Physiology to Industry, by G. P. Crowden 91

Thallium Poisoning 96

The Medical Department Manual, by Hart E. Fisher, M.D., F.A.C.S.
—The Complete Handbook of Organization, Operation and Routines—
Section II—Physical Property 97
Section III—Personnel 99

Operation of Laws Providing Benefits in Case of Injury, Sickness, Old Age, and Death 104

Methylene Blue in Aniline Poisoning 107

Who's Who in I. M. & S. 108
—The Reactions, Each Upon the Other, of an Alert, Creative Mind and Two Decades of Industrial Medicine—

Significances and Coincidences 111

Pneumonokoniosis (Silicosis) 112
—Bibliography & Law—

Containers of Poisonous Fumigants 112

Our Problem Page 113
—VI. Carbon Bisulphide Poisoning—

Bone Button Infecton in Industry, by Dr. Claude William Chamberlain 114

Absenteeism,
Accident—
Costs,
Hazards,
Prevention,
Records,
Acids,
Administrative Problems,
Advisory Services,
Age,
Air Conditioning,
Allergy,
Amputations,
Anesthetics,
Antiseptics,
Apparatus,
Athletics,
Awards,
Bacterial Infections,
Baths,
Benefits,
Biological Tests,
Biology,
Chemicals,
Chemistry,
Children in Industry,
Claims,
Classification of Results,
Clinics—
Dental,
Medical,
Clothing Hazards,
Community Services,
Compensation,
Compensation, Insurance—
Costs,
Forms,
Records,
Consultation,
Convalescent Homes,
Cooperative Units,
Court Decisions,
Degenerates,
Dental Service,
Dependency,
Diagnosis,
Diagnostic Tests,
Diet,
Disabilities,
Disease Prevention,
Disfigurement,
Disinfection,
Dispensaries—
Costs,
Forms,
Records,
Dressings,
Drugs,
Dust Control,
Economics,
Electrotherapy,
Emergencies,
Employee—
Environment,
Examinations,
Hazards,
Insurance,
Placement,
Welfare,
Employer—
Costs,
Liabilities,
Responsibilities,
Employment,
Epidemics,
Epidemiology,
Estoppels,
Ethics,
Examination—
Costs,
Forms,
Records,
Executive Examinations,
Expert Testimony,
Extra-Medical Activities,
Eye Tests,
Fatigue,
Female Employee Problems,
First Aid—
Equipment,
Instruction,
Frequency Rates
Fumes,
Functional Tests,
Gases,
Grading Applicants,
Gymnasium,
Habits,
Health—
Education,
Maintenance,
Surveys,
Heating,
Heliotherapy,
Hospital—
Costs,
Equipment,
Forms,
Records,
Hospitalization,
Hours,
Hydrotherapy,
Idiosyncrasies,
Impairments,
Industrial—
Accidents,
Clinics,
Commissions,
Dentistry,
Diseases,
Gynecology,
Hospitals,
Hygiene,
Injuries,
Medical Service,
Medicine,
Neuroses,

Epidermophytosis, by Hart Ellis Fisher, M.D., F.A.C.S. 115
Hernia and Lymphatic Leukemia 116
Medical Changes 116
Editorial:
Can't Collectivize Medicine 117
Ingested Aluminum 118
The Effects of Dusts 118
Sickness Records 119
Erysipeloid 120
Estimation of Basophilic Cells 120
Dermatitis in Rubber Workers 121
Industrial Medicine Digest:
—**Spontaneous Fractures**, Drs. Kurt Garve and C. E. Early, *Illinois Medical Journal* 122
—**Fracture Treatment and Medicolegal Work**, Dr. Edward Adams, *International Journal of Medicine and Surgery* 122
—**Leg Fractures**, Dr. Edward T. Newell, *International Journal of Medicine and Surgery* 123
—**Control of Occupational Diseases**, Dr. W. Irving Clark, *National Safety News* 123
—**Mechanical Control of Occupational Diseases**, David S. Beyer, *National Safety News* 124
—**Respiratory Protection**, William P. Yant, *National Safety News* 125
—**New Fracture Treatment**, Dr. Leroy H. Oetjen, *Journal of the Florida Medical Association* 126
—**Types of Medical Practice**, Dr. John McCombe, *International Journal of Medicine and Surgery* 127
—**Noise and Hearing**, Dr. C. C. Swann, *International Journal of Medicine and Surgery* 128
The Bulletin of The American Association of Industrial Physicians and Surgeons, Volney S. Cheney, M.D., Editor 124
The Industrial Doctor, Official Journal of the New York State Society of Industrial Medicine, Frank E. Redmond, Managing Editor 125
Central States Society of Industrial Medicine and Surgery 126
Industrial Physicians and Surgeons 129
—Department of Personal Mention—
Industrial Medicine News:
Accidents Reduced 130
Lead in Canned Sardines 130
Compensation in Czechoslovakia 130
Asphyxial Death 130
The Nose and Dust 131
Silicosis and Other Dust Diseases 131
NRA Survey 132
Write for Detailed Information 132
—Manufacturers' News—
New Books 135
Cumulative Index 135

Last Page

This magazine is published to promote sound thought upon and concerning industrial medicine. To that end it will contain articles, news items, reports, digests and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited. The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the articles and opinions of their authors —the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

Nursing,
Ophthalmology,
Psychology,
Sanitation,
Surgery,
Toxicology,
Infection,
Inoculation,
Insurance—
Casualty,
Compensation,
Disability,
Health,
Life,
Policies,
Records,
Job Analysis,
Laboratories,
Law,
Legal Medicine,
Legal Procedure,
Life Extension,
Lighting,
Lost Time Accidents,
Malingering,
Malpractice,
Medical—
Books and Publications
Corporations,
Costs,
Economics,
Equipment,
Ethics,
Examinations,
Forms,
Jurisprudence,
Personnel,
Records,
Service,
Sociology,
Supervision,
Supplies,
Medical Department—
Costs,
Functions,
Standards,
Mental—
Disability,
Hygiene,
Metabolism,
Mutual Aid Societies,
Mutual Benefit Associations,
Neuroses,
Noise Elimination,
Nurses—
Industrial,
Part-time,
Practical,
Visiting,
Nursing Organizations,
Occupational—
Accidents,
Diseases,
Hazards,
Injuries,
Poisons,
Operative Surgery,
Ophthalmology,
Oral Hygiene,
Orthopedic Surgery,
Oral Work,
Patent Medicines,
Pathology,
Personal Injuries,
Physical—
Examinations,
Therapy,
Physicians—
Consulting,
Industrial,
Part-time,
Services,
Physiology,
Plastic Surgery,
Policies, Insurance
Pre-Employment Examinations,
Preventives,
Professional,
Requirements,
Proprietary Medicines,
Protective Garments,
Psychiatry,
Psychology,
Public Health Agencies,
Reconstructive Surgery,
Recreation,
Re-Dressings,
Re-Examinations,
Rehabilitation,
Relations with Private Practice,
Remedial Agencies,
Research,
Respirators,
Rest,
Restaurants,
Resuscitation,
Roentgenology,
Routine Examinations,
Sanitariums,
Sanitation,
Scars,
Seating,
Serotherapy,
Serums,
Severity Rates,
Sick Benefits,
Specialists,
Special Services,
Staff Organization,
State—
Boards, Functions,
Laws,
Medicine,
Supervision,
Statistics,
Superannuation,
Surgery,
Symptoms,
Temperature,
Terminology,
Tests,
Therapeutics,
Toxicology,
Traumatic Surgery,
Treatment,
Treatment Procedures,
Unemployables,
Vacations,
Vaccination,
Ventilation,
Visual Tests,
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Call it Mansoul or economic law,
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And when it moves
It will employ a hard and actual stone
To batter into bits an actual wall
And change the actual scheme of things."

—STEPHEN VINCENT BENET

The Law, the Science and the Economics of Industrial Health

Volume 3 FEBRUARY, 1934 Number 2

The Importance of Pyschology

—*Its Bearing on the Efficiency, Well-Being and Happiness of Employees*—

by

RICHARD STEPHEN UHRBROCK

Head of Statistical & Research Department, Industrial Relations Division, The Proctor & Gamble Company

PSYCHOLOGY is the science of explaining, predicting, and controlling behavior. There is nothing occult or mysterious about it. The psychologist, like the physicist, or chemist, performs many minor experiments under controlled laboratory conditions. Then he confirms his promising leads by means of the analysis of quantities of data, gathered upon a larger scale. He applies rigorous mathematical techniques in order to confirm his conclusions and to rule out chance and opinion as much as possible. He constantly is asking the question, "How great a difference must there be between two sets of data for it to be really significant and not due merely to chance?" He wishes his conclusions to be based upon known facts. His final results should be so stated that another independent investigator could verify the general conclusion if he repeated the experiment. Business men constantly are concerned with the problem of anticipating the possible reactions of their associates, employees, and customers to changing conditions. They are searching for the things that result in favorable responses. They want to identify the situations that annoy and repel people, so that such situations can be avoided. In so far as the business man is concerned with explaining, predicting, and controlling the behavior of human beings (including himself), he is concerned with psychology and its applications.

"Please tell me how you like this perfume," said the demonstrator in the department store, as she held out the test tube containing a colorless liquid. The customer paused, took the tube, and inhaled cautiously. Almost immediately the demonstrator presented another test tube, "Or, do you like this one better?" Before she really knew that she was the subject in a psychological experiment the customer had passed judgment upon six different perfumes, and had arranged them in order, from most preferred to least preferred. The demonstrator made notations in her record book, and was ready to continue her task of gathering data on the preferences of customers.

That scene was repeated in a score of department stores during the week. More than 1,000 women indicated their likes and dislikes for six samples of perfume. This gathering of data on a large scale served to confirm certain findings previously made in a psychological laboratory. The perfume most preferred was put in a bottle designed by a clever artist. A famous opera star was induced to lend her name to the enterprise, and the facts were presented to the public in a specially prepared advertising campaign. Needless to say the popularity of the new perfume was instantaneous. As was to be expected, it appealed to large numbers of women. The container made a pleasing impression, and the prestige of the prima donna's name helped the users of the perfume to imagine that they too had interesting and charming personalities.

THERE are countless illustrations of the application of psychology to industrial prob-

lems. Laboratory investigations of vision revealed the fact that a small proportion of men are color-blind. Such persons may be totally unaware of the defect, as was discovered by Miles and Craig when they tested 375 salesmen in San Francisco department stores who were selling colored goods.[1] "The examination revealed 27 well-marked cases of color-blindness who were actually selling colored materials." No doubt many of these men caused serious financial loss to their employers, through the mistakes they made. Color-blindness may prevent men from successfully following a number of occupations. Railway engineers and students at Annapolis and West Point early were subjected to tests for color-blindness. The psychological knowledge regarding the problem is useful, not only for purposes of vocational guidance, but also for the selection of employees in certain industries. The textile worker who deals with colored fabrics, the chemist whose job is to match samples of oil on the basis of color, and the landscape painter or the interior decorator who is color-blind cannot hope to compete successfully with those who do not have that defect. Color-blindness may be an important factor in causing automobile accidents. It is highly probable that a certain small proportion of drivers cannot tell the difference between red and green lights.

A VERY famous document states, "All men are born equal." Psychology, on the other hand, is concerned with how men differ. We know that men differ in height, weight, in the strength of their grip, in the speed with which they can run 100 yards, in the number of words in their vocabularies, in ability to understand the content of a printed page, in ability to add a column of figures quickly and accurately, in ability to take mechanical objects apart and to put them together again, in ability to get along with other people, and in general intelligence. In fact, the psychologist could make out a good case for the statement that, "All men are born different." Mental and physical abilities distribute themselves according to certain well defined principles. If we plot the distribution of height of 1,000 young men between the ages of 21 and 22 in Columbus and also the height of an equal number of young men of the same age in Indianapolis, the two curves will be practically the same. The average (or mean height) would be almost identical—approximately five feet eight inches. There would be about the same proportion of men above six feet in height in the two groups and the number of men shorter than four feet six would be about the same. Unless they were labelled it would be almost impossible to tell the two curves apart. The psychologists have found that mental ability is distributed in about the same way. If we gave a general intelligence test to the 1,000 young men in Columbus and the 1,000 in Indianapolis, we would find that they varied from extremely bright to extremely stupid. The average for the two groups would be about the same, because they came from about the same racial stock, and had had, on the whole, roughly the same environmental opportunities. There would be about the same number of superior young men in each group. The number of morons, imbeciles and idiots would be approximately the same. Knowing that ability is distributed according to ascertainable laws, and that the findings in one group, or sampling, will be duplicated in another group it is possible to develop a science of measurement of mental abilities.

The distribution of general intelligence is well shown in a table developed by Arland D. Weeks.[2] Based upon data obtained from the results of several million intelligence tests, the table shows how intelligence is distributed in the general population of the United States.

		I. Q.
250,000	"Near Genius" or Genius	140—up
6,750,000	Very Superior	120—140
13,000,000	Superior	110—120
30,000,000	High Average	100—110
30,000,000	Low Average	90—100
13,000,000	Dull	80— 90
6,000,000	Border-Line	70— 80
750,000	Morons	50— 70
250,000	Imbeciles and Idiots	50—down

(Based on data from Sandiford)

Distribution of Intelligence in the United States

The imbeciles and idiots do not enter industry, but individuals representing all of the other classifications can be found in any large establishment. The low average, dull, border-line cases, and many of the morons "get by" the average employment interviewer, particularly if they are physically well set up, neatly dressed, and if they can answer a few simple questions correctly. Their subnormality shows up in many ways; for example, in the length of time it takes to teach them the elements of their jobs, their poor

1. W. R. Miles and Homer Craig, Jr., Color Blindness in Dry Goods Salesmen, *Personnel Journal*, 9, 1931, 437-49.

2. Arland D. Weeks, Mental Differences and Future Society, *Scientific Monthly*, 32, 1931, 156-62.

judgment, mistakes, and errors. A half-hour intelligence test, given at the conclusion of the interview often reveals glaring mental defects. "Figures recently made public by the War Department show that during the three-month period ending September 30, 1932, 5,583 out of a total of 9,252 applicants for original enlistments were rejected for various reasons. Of the number rejected, 857, or 9.3% of the total applicants for original enlistment, were denied admission to the army because of the failure to pass the intelligence tests."[3]

NO EMPLOYER would hire a man who was totally deaf and blind in one eye, to serve as chauffeur of an expensive car. Some employers will hire men and women for even more responsible positions whose mental equipment is poor and who cannot be taught to do other than simple routine operations. The psychological techniques for the discovery of such persons are relatively simple. Any competent psychologist, trained in mental-test technique, can set up the procedure for the average employer, so that his employment clerk can administer it with a significant degree of accuracy.

The table that Weeks developed is interesting from another angle. During the past three years many employers have been forced to reduce their working forces. What has been the basis for the elimination of men? How much have intelligence and other measurable mental traits been taken into consideration when it became necessary to let men go? How many employers have fired their high average and superior workers, and kept the low average and dull ones? When business picks up again will they be able to spot those with real ability, and think twice before they take on the slower-witted ones? Undoubtedly, in our modern industrial society, there is a place for all levels of ability. But the proposition is self-evident that it is unprofitable in the long run to use weak timber where strong support is needed.

VOCATIONAL success depends upon the smooth integration of many factors. As psychologists have developed scientific methods of evaluating the capacities, abilities, and "chances of job success" of men, they have demonstrated the unreliability of systems of astrology, palmistry, phrenology, numerology, graphology, physiognomy, etc., as means of selecting employees. In spite of a widespread belief to the contrary, no significant differences in mental alertness and important character traits have been shown to exist in groups of blonds and brunettes. Neither can we estimate intelligence from photographs with any satisfactory degree of success. The evidence is negative regarding the predictive value of the shape of a man's profile, or texture of hair or skin. Behavior that results in success on the job is too complex to be measured by such simple methods.

Scientific psychology demands that measures purporting to predict vocational success be reliable in the sense that they will give practically the same result in the hands of two independent investigators; that they be objective and not dependent upon the unchecked opinion of an observer; and that they be valid, in the sense that they predict in terms of some external and agreed-upon criterion. Many of the systems of evaluating personality now exploited by non-accredited psychologists cannot satisfy demands regarding reliability, objectivity, and validity.

THE INDUSTRIAL psychologist of the future probably will give as much attention to the discovery and development of important character traits as to the measurement of innate intelligence. Over a period of years at Purdue University records have been maintained showing the intelligence and character traits of engineering students. A follow-up of graduates five years after leaving college indicated that the difference between the extremely bright students and those who had only enough intelligence to get through college made a difference in earning power of about $150 per year. Those with pleasing personalities, however, were earning nearly $1,000 per year more. Apparently industry is willing to pay for desirable personality traits. Tact, self-reliance, enthusiasm, accuracy, and aggressiveness are important characteristics that may be developed under proper industrial conditions. The problem offers a challenge to the industrial psychologist.

The recent investigations of Weiss and Lauer reported in Psychological Principles in Automotive Driving are of particular interest to operators of bus lines, taxicab companies, employers of truck drivers operating motorized vehicles, and drivers of personal cars.[4] The employer who hires a poor driver for his bus or truck may pay for his lack of judgment when the car is wrecked or when pedestrians are injured or killed.

3. *Recruiting News*, 14, 1932, 14.

4. Albert P. Weiss and Alvh R. Lauer, *Psychological Principles in Automotive Driving*, Columbus, Ohio: Ohio State University, 1930. VII-165. (Ohio State University Studies, Graduate School Series, Contribution in Psychology, No. 11.)

Careful selection becomes a form of insurance. Weiss and Lauer studied the eye, hand, and foot coordinations of 450 autoists over a period of two years. Accident proneness, they found, may occur in all levels of intelligence. It may be related to defective vision, hearing, poor coordination, slow reaction time, day dreaming, or a combination of factors. They stated, "There is a small percentage of drivers who will not learn. These must be eliminated from the road by legal methods." Their carefully prepared rating scale for checking the driving habits of autoists is a valuable tool that employers of chauffeurs would find it profitable to investigate and use. Theirs was an eminently practical piece of psychological investigation that has enormous social and economic importance.

SUPPOSE you were planning to put a new package product on the market. How would you determine the color to be used? It would be unsafe to rely upon your personal preferences, because they might not be typical. Color preferences have long interested psychologists, and lists for various ages and racial groups have been published. Recently the effect of color upon judgment of size was studied. The investigators used samples of gray, yellow, blue, white, black, green, red and purple. They reported, "The results obtained show that light objects appear comparatively large and dark objects comparatively small."[5] This study, probably made without thought of its industrial implications, may be of value to some manufacturer who wishes to appeal to the tendencies of economical customers to reach for the package which appears larger.

A study of "the effect of size of pattern on the apparent brightness of rubber tile flooring" also is important.[6] Wendt found that "it required 5% to 7% more illumination on the small pattern to make it appear equally illuminated with the large . . . a rubber tile floor composed of alternate light and dark squares will appear brighter when its pattern is made up of larger units." Those who have dark and sombre offices and stores should note this fact in choosing floor coverings.

Dr. A. L. Winsor, working at Cornell University, has studied the secretions in the mouths of people when they thought of food, saw food but could not smell it, after chewing food, after smoking tobacco, after prolonged thirst, etc. A suction disc covered the parotid gland in the inner cheek of the subject. The secretions of this gland were conveyed through a tube, so that the amount released could be counted drop by drop. Dr. Winsor's work can be classified as pure research in physiological psychology. A study of his published results will interest the food merchants of the country, restaurateurs, sellers of candies, and sellers of smoking tobacco. His basic researches throw some light upon the meaning of appetite. He has stated, regarding his findings, "On many occasions the secretion was increased when the subject sat looking at food, particularly if it was a situation in which he had previously partaken of food visualized. The peeling of an orange, or the squeezing of juice from an orange was always effective in causing a marked increase in the salivary secretion. This increase was not comparable in volume to the amount evoked by direct stimulation, but it was usually from 100% to 200% more than the flow without the visual stimulation."[7]

This is important when we remember that in fear, anger, or other unpleasant emotional disturbances the mouth is dry. Dr. Winsor has measured, in an objective way, the anticipation of pleasurable intake of food. The soda fountain manager who makes a ritual of squeezing oranges and limes where the waiting customer can see the process heightens the enjoyment of his guests and probably increases his profits. The restaurateur who shows his salads, not too obviously, stimulates the internal secretions of his patrons. Perhaps the salads should be brought within the line of vision, but left on a side table for a very short period before being served. An interesting field for further research is indicated. A food distributing corporation operating on a large scale probably will find it profitable eventually to have such a physiological psychologist as Dr. Winsor on its staff for the sole purpose of studying, scientifically, the reactions of persons to food. The method of study that has been developed is important. This laboratory technique may reveal how to serve spinach so children will ask for more!

PHYSICIANS and nurses have watched countless patients during sleep. A psychologist, H. M. Johnson, and his associates, working

5. Carol Gundlach and Constance Macoubrey, The Effect of Color on Apparent Size, *American Journal of Psychology*, 43, 1931, 109-111.

6. G. R. Wendt, Two Industrial Applications of a Psychophysical Method, *Journal of Applied Psychology*, 1932, 16, 269-76.

7. A. L. Winsor, Conditions Affecting Human Parotid Secretion, *Journal of Experimental Psychology*, 11, 1928, 355-63.

on the Simmons Investigation of Sleep at Mellon Institute, Pittsburgh, studied sleep habits by means of the motion picture camera and other instruments, which gave a record of the sleeper's movements.[8] The sleep habits of 112 persons were studied nightly for periods ranging from several weeks to two years.

"In a word, the results are as follows: The most typical of our healthy sleepers changes from one gross bodily position to another between 20 and 45 times in the course of a typical night of eight hours, each of these stirs being separated from its nearest neighbor by at least two and a half minutes. Approximately half of all the postures that he takes on such a night are held less than five minutes; about a fifth for from five to 10 minutes; about a tenth, for from 10 to 15 minutes, and so on. Less often than once a night does he lie still for as long as an hour at any one time. Of course, there are large variations among individuals, and the same individual also varies considerably from night to night. . . .

"These observations completely upset the notion that healthy sleep is taken in a few positions, each of which is held for a long time. In fact, it was only by means of heavy medication with opiates combined with paraldehyde that any of our hospital patients gave a picture of 'loglike' slumber. The healthy sleepers never gave it.[9]

"If the sleeper is provided with an unfavorable combination of spring and mattress, the effect is to reduce the variety of postures taken but not to reduce the frequency of shifting from one to another."[10]

The findings of this psychological investigation will influence advertising campaigns and selling talks, as well as the construction of springs and mattresses. The company using the data will be operating on facts rather than opinions and hunches.

INDUSTRIAL organizations have long been interested in house organs, company histories, descriptions of products, employee's handbooks, and a host of other leaflets and booklets to be distributed to employees. Much of the material is written by college-trained people with fairly extensive vocabularies. The persons receiving the printed matter often have little education and limited vocabularies. For years the psychologists have studied the vocabulary equipment of persons of various ages and educational background. Many persons have been found whose spoken vocabularies numbered less than 1,000 words. They could read even fewer words. At the other extreme, John Milton used 17,000 different words in his published writings, and Shakespeare employed more than 24,000.

The following table, prepared from data presented by J. M. Gillette, gives some indication of vocabulary differences: [11]

8 years old	3,600 words
10 years old	5,400 words
12 years old	7,200 words
14 years old	9,000 words
Average adult	11,700 words
Superior adult	13,500 words
College freshman	9,240 words
College sophomore	10,860 words
College junior	13,040 words
College senior	12,700 words

Thorndike has listed the 20,000 most commonly used words in the English language.[12] It is possible to take his list and find out if a given bit of writing is too difficult for the prospective reader. It would be a shock to the executives in some corporations if they should study the difficulty of the words in their books of rules and regulations, which were prepared by college-trained writers to be distributed to workmen who escaped from school in the fifth and sixth grades because their studies were getting too difficult for them. It probably is safe to say that handbooks for the average factory worker should be written in the simple vocabulary represented by the 3,000 most commonly used words in the English language. The psychologists have made available the facts regarding vocabulary difficulty. They are ready for use by the industrialist who wishes to make his printed instructions understandable to his workers. If printed words are not in the vocabularies of the workers, even though they are English words, the booklets might as well be written in Latin, so far as their effectiveness is concerned.

That a real problem is involved here is indicated in a study of the telephone conversations of 3,800 persons made by telephone engineers and reported in the *Bell System Technical Journal*.[13] Although 80,000 words were spoken, there were only 2,240 different words in the conversa-

8. H. M. Johnson, T. H. Swan, G. E. Weigand, In What Positions Do Healthy People Sleep? *Journal of the American Medical Association*, 1930, 94, 2058-62.
9. Johnson, et al., op. cit., 2061.
10. Johnson, et al., op. cit., 2062.
11. J. M. Gillette, Extent of Personal Vocabularies and Cultural Control, *Scientific Monthly*, 1929, 29, 451-57.
12. E. L. Thorndike, Teachers' Word Book, New York: Teachers' College, Columbia University, 1931. VII-182.
13. *Science News Letter*, August 15, 1931.

tions; 819 words were used only once. "Thus 99% of 80,000 words of conversation was made up of only 1,421 words used over and over again many times." More than four-fifths of the conversations were made up of one syllable words, such as "I," "you," "get," "see," "know."

THE BOSTON Elevated Railway Company and the Milwaukee Electric Railway & Light Company have employed the service of psychologists to reduce the accident records of their motormen. A dollar and cents value can be placed on the results of their work. In Boston, Slocombe and Bingham reported that, "Differences in ability to operate a street car or motor-bus with safety were found to correspond with differences not only in training and in length of experience, but also in physical condition as indicated by blood pressure, and in skill in saving electric power as measured by automatic coasting recorders attached to the street-cars."[14] It was found that approximately half of the accidents occurred to less than a third of the operators. "In one sample of 200 men of ample experience and maturity in the service, half the accidents happened to only one-fifth of the motormen." It was found that the better motormen (that is, those with the lowest accident records) had high coasting records. This may be stated in another way by saying that the better motormen were economical in the use of power and equipment. The work of Slocombe and Bingham also indicated that older men with abnormal blood pressure and younger men with very limited experience were more than ordinarily prone to accident. Their work did not stop here. Methods for the selection and training of motormen were developed. In a later, informal report, before the Personnel Research Federation, Dr. Slocombe stated that "62 out of 94 high accident men in one division of the Boston Elevated Railway had, as a result of specific re-training methods and follow-up, been cured of their high-accident tendencies. Their accidents were reduced from 6.4 to 2.3 per annum."[15]

THE EMPLOYMENT man and the department head often discover trouble-makers and queer and unusual people. The industrial psychologist, as he pursues his studies, notes many cases of personality maladjustment. Unless he is specially trained in mental-hygiene work and has had considerable clinical experience, he would do well to confine himself in the main to the problems of selection and training. At the present stage of development of industrial psychology, the treatment of cases of marked abnormality should be left to the physician and psychiatrist. Very successful handling of problem employees in industry has been done by Dr. V. V. Anderson, a psychiatrist with R. H. Macy & Company, in New York City. He has said, "Taking 1,200 employees as a fairly representative group indicating the 'run-of-the-mine' of the store at large, we have found that 19% of the sales people and 23% of the non-sales force were problem individuals presenting conditions that caused their department head to question their value as personnel risks to the store. Many of these individuals were actual liabilities. All of them were potential liabilities to the store."[16] An industrial psychologist may aid in recognizing such problem cases, and, with the aid of psychiatrists, he can assist in setting up selective devices that will reduce the number of such persons hired. After a case of dementia praecox, or paranoia, is recognized, the industrial psychologist has no more right to attempt therapeutic measures than he would if he recognized the disturbance as typhoid fever or smallpox. For many years to come the industrial psychologist will find that the demands that can be made upon him in the selection and training of normal individuals will keep him busily occupied. He needs the sympathetic cooperation of the physician and the psychiatrist. He should not attempt to usurp their functions.

INTERESTING studies of boredom in industry have been made by S. Wyatt, of London. He has stated, "Not all workers are subject to boredom, but after two hours at the same task most operators become restless and continue work with effort or reduced efficiency. Boredom is experienced less in the afternoon than in the morning. The mechanisms underlying boredom appear to be illuminated by a temporal illusion noted in bored workers; time elapsed is overestimated. The nature of the task contributes to boredom; operations involving attention and adjustment in response to varied situations are in general less boring than those requiring only intermittent or partial attention; while tasks so automatized as to permit uninterrupted mind wandering seem to produce—in workers tem-

14. C. S. Slocombe and W. V. Bingham, Men Who Have Accidents (Individual Differences Among Motormen and Bus Drivers). *Personnel Journal*, 1928, 6, 251-57.

15. *Personnel Journal*, 1929, 7, 400.

16. V. V. Anderson, "The Problem Employee: His Study and Treatment," *Personnel Journal*, 1928, 7, 203-25.

peramentally suited to repetitive work—a minimum of boredom, which suggests a means for its avoidance. Keeping pace with a rhythmically operating machine; teaching the operator the importance of the work he is doing; supplying material in small lots rather than in an endless flow along a belt; improving working conditions, both for the prevention of unpleasant day dreams about the job and for the development of pride in the organization and satisfaction in the job are all indicated remedies for the dissipation of boredom. Facilities for developing a richer life outside the factory will be provided by employers interested in the development of the worker as a citizen."[17] Boredom and fatigue are not the same, although either, or both, may result in reduced output. "There is not the least doubt that a rest of 10 minutes duration, introduced about the middle of the work-spell, tends to neutralize the unpleasant and unfavorable effects of repeated activity, and is capable of producing an increase in output varying from 2% to 10%."[18]

A SIX MONTHS' study of the effect of noise upon efficiency was made in the Colgate University Psychological Laboratory. The procedure reproduced the conditions in 75% of the light industrial establishments in this country. The general conclusion of Dr. Donald A. Laird, who directed the study was to the effect that "noise cuts down production and costs money; and the cost of noise varies directly with its volume." It was found that noise equivalent to group conversation reduced production approximately 3%. Unsteady and intermittent noises were most irritating. "But the effect of the noise didn't stop with lower efficiency; it had definite results on the well-being of the workers. After periods of heavy noise, they complained of muscular stiffness—the direct result of tenseness caused by the clatter. The greater the noise, the more frequently they needed time-wasting rest periods. And buzzing noises lingered in the workers' ears for as long as three hours after the five o'clock whistle had blown."[19]

This same general conclusion regarding the effects of noise was reached in the course of a study made in England. "Typists working under quiet and under noisy conditions showed an average decrease of about 3% in speed and an increase of over 13% in energy expenditure under noisy conditions. It is interesting to note that those most affected by noise were the fastest typists—those, presumably, who were working nearest to the limit of their capacity."[20]

THE INDUSTRIAL psychologist is concerned not only with discovering ways and means of increasing the efficiency of well-selected employees, but also with the well-being and happiness of workers. Thus, such things as illumination, the proper distribution of rest pauses, and common annoyances become legitimate fields of inquiry. In a study of supervision and morale, made at the Hawthorne plant of the Western Electric Company, Elton Mayo found that the "method of the supervisor is the single most important outside influence. Home conditions may affect the worker and his work; a supervisor who can listen and not talk can, in many instances, almost completely compensate such depressing influences."[21] In a study of employee attitudes, Kornhauser and Sharp found that "negative feelings aroused by poor supervision may spread to other unrelated matters."[22] If the employer carefully selects and trains his workers, pays them well, and provides a satisfactory working environment, his best efforts may be nullified by a foreman who antagonizes those under him. The industrial psychologist has an unparalleled opportunity to study the factors that contribute to the development of leadership.

IN THE decade from 1920 to 1930 the personnel men and industrial psychologists were concerned primarily with the development of techniques and methods of selection. The present decade is witnessing a shift in emphasis. Training-on-the-job is moving to the center of the stage. Definite instructions, based upon job analysis, are being developed. The industrial psychologist is thinking about methods of improving accuracy. He is convinced that learning is specific, rather than general. Problems of order of difficulty, and rate of learning are coming to the fore. The concept of the plateau in learning where the worker and the instructor put forth their best efforts, and still progress is not made, must be recognized as a normal condition that clears up if practice and encouragement con-

17. S. Wyatt, Boredom in Industry, *Personnel Journal*, 1929, 8, 161.
18. Wyatt, op. cit., 167.
19. Donald A. Laird, Noise Does Cut Production, *Forbes*, Aug. 15, 1932, 30, No. 4, p. 13.
20. Henry J. Welch and George H. Miles, *Industrial Psychology in Practice*. London: Sir Isaac Pitman & Sons, Ltd., 1932. 134.
21. Elton Mayo, Supervision and Morale, *Journal of the National Institute of Industrial Psychology*, 1931, 5, 248-60.
22. A. W. Kornhauser and Agnes A. Sharp, Employee Attitudes, *Personnel Journal*, 1932, 10, 393-404.

tinue. As the industrial psychologist views the problem of training-on-the-job he is concerned with means of evaluating the effectiveness of his work. He is devising measures to audit the skills and information possessed by the beginner, or the older employee who is to be "up-graded." Specially prepared psychological tests are being developed to measure degrees of skill, or knowledge, and to indicate progress as training is continued.

Learning is a relatively slow process. It cannot be forced. Opportunity must be given for practice under favorable conditions. The trainer should remember that forgetting sets in immediately when active practice ceases. Individuals in psychological laboratories have carefully learned names of company products, foreign words, etc., so that they could repeat the entire list without error. An hour later they were retested to see how much was forgotten. Under such circumstances it does not surprise the experienced psychologist to discover that one-half of the new ideas or words cannot be recalled 60 minutes after learning has been stopped. A day later only about one-third of the original material is retained. At the end of a month, unless relearning takes place, only about one-fifth of the facts can be recalled correctly. Yet foremen, supervisors, and superintendents continue to expect workmen to remember orders and directions after they are told once. Reteaching of the things that have been forgotten is accepted as a normal procedure by the successful trainer of men. Individual differences exist in the rate of learning. In some situations it is possible to find persons who can learn four times as fast as others.

IT IS NOT the function of the industrial psychologist to tell his employer how to run the business. Neither should his work duplicate that of other fact-finding units in the organization. It should be supplementary. The work of the industrial psychologist is grounded in the recognition of individual differences. His field of study embraces those things which have a bearing upon job effectiveness. Consequently, he studies the capacities, abilities and interests of men. He is interested in the friction points in the work situations, as well as those things which improve attitude, morale and satisfaction. He considers opinions and beliefs, but uses them as starting points for gathering facts regarding personnel problems. The effect of non-financial and financial incentives and their relationship to output will receive increasing attention. Accident experience, and the forces that contribute to the development of boredom and fatigue, are of particular interest.

The psychological approach to industrial problems presents facts that hitherto have not been available for consideration by management. The industrial psychologist is concerned with the application of scientific method to the continuous adjustment of workers to their work.

IT WOULD be profitable for each large manufacturing organization to have a small laboratory set aside for the individual testing of workers. Materials have been tested for years. The methods of measuring the abilities of human beings have received comparatively little attention in industry. The emphasis should not be placed on paper and pencil tests. The testing program should be designated to measure essential skills used in daily work. If a factory has a wage incentive system in operation, a group of about 100 high bonus earners could be designated for study, in order to determine their characteristics. Then, the employment department could be guided in its future selections so that new men could be hired like the best of the present group. A very essential part of the research program would be the study, *at the same time*, of another group of 100 workers, who were on wage incentive, but who failed to earn bonus, or who barely came up to the standard that had been set. The members of this "low" group should be comparable with the members of the "high" group in so far as age, sex, education, length of service, and other important considerations are concerned. In fact the two groups should be matched, person by person, on every possible consideration with the single exception of bonus earning record. To the average observer, or even to the trained employment manager, it should be practically impossible to tell whether a man was in the "high" or "low" group so far as appearance, or interview report, was concerned. Also, if possible, a third group of comparable persons, not on wage incentive, should be designated for study.

The psychological laboratory in the factory would not be as formidable as the name, and the person in charge would not call himself a psychologist. This type of research should be introduced casually and unobtrusively. The man who reported for testing would be seated at a table that had a telegraph key mounted on its top. He would be told, "Let's see how fast you can tap

this key in 30 seconds." An electric counter would record the result. A record would be taken for each hand. By means of a pedal arrangement, foot tapping records could be obtained, particularly if the industrial workers were required to operate treadles or valves by foot pressure. Many studies have indicated that marked individual differences exist in speed of response tests, such as tapping a telegraph key. In a group of 100 persons it is not at all unusual to find one person who is four times as fast as the slowest one in the group.

A series of form relations tests that require the worker to assemble blocks of wood may be introduced. Certain simple tests may require him to react to a two dimensional pattern. Other, more difficult forms of block assembly tests, may force him to take three dimensions into consideration. The Uhrbrock block assembly test, which is illustrated here, is composed of six ir-

This test requires the applicant to react to a three-dimensional problem.

regular units of wood. When properly assembled, the completed block measures 8x8x4 inches. Recently, this test was given to 38 college graduates. Most of them had had some form of engineering training. The average time was six minutes, five seconds. The fastest man assembled the blocks in one minute, 36 seconds. The slowest man required 23 minutes.

No one test can be used as a satisfactory measure of a man's abilities. Interesting and valuable results would be obtained by means of a series of such tests, when applied to the groups of high and low bonus earners.

The study of workers on wage incentive should include simple tests for visual and auditory acuity. A small proportion of the group will be color-blind. If color plays a part in their daily work, e.g., assembling articles of different colors, that fact alone may indicate the difference between earning, or not earning a bonus in an individual case. Many workers no doubt get auditory cues from their machine, that help them to time the rhythm of their movements. The auditory factor often is neglected in the study of workers' learning difficulties.

A steadiness test, consisting of a metal plate with different size holes may be employed. The worker is provided with a metal rod to insert in the holes. The rod and the plate form part of an electric circuit. If the worker inserts the rod into the holes without touching the metal he scores high on steadiness. Every time he touches the rod to the metal, the circuit is completed, and an electric counter records the error.

Strength of grip, for right and left hand may be measured by the dynamometer, and lung capacity may be gauged by means of the spirometer. It is possible to extend the series of simple tests almost indefinitely. It is highly important to introduce test situations patterned after the daily work of the person being examined.

After the "high" and "low" bonus earners have been tested individually in a variety of situations the results can be evaluated to determine the significant differences in the sensori-motor equipment of the two groups. As an extreme example, if it should be found that the "low" bonus earners have defective hearing and vision, and are below average in all of the speed tests, steadiness, and assembly operations, and that the "high" bonus earners have the opposite characteristics, the conclusion would be obvious: Select new workers like the best of the present group by introducing a series of simple tests into the employment set-up. Such tests would naturally follow the interview, and would serve to measure significant qualities, such as speed, steadiness, sensory acuity, the ability to see form relationships, etc., that cannot be evaluated accurately solely by interview methods.

INDUSTRY will quickly discover the value of the psychological approach to its problems of selection and training of industrial employees when paper and pencil tests are relegated to a secondary position. The way to an understand-

ing of fundamental differences that exist between successful and unsuccessful factory workers lies in the direction of individual measurement of abilities that have apparent relationship to the daily work of the employee. If speed is essential, give a number of speed tests. If steadiness is necessary, test for that quality. If fine coordination of finger and arm movements is desired, provide test situations that will measure such skill. The problem is essentially a practical one. Many techniques are already developed to aid in its solution. Men and women are trained to make such investigations. The Psychological Corporation in New York City is available for consultation in planning a test research program. The industry that uses such techniques in a large and thorough-going fashion will discover that it is possible to find new employees like the best of the present group. The advantages in terms of lowered training costs, and increased production, are obvious.

Some Medicolegal Aspects of Silicosis Problems

By Dr. M. James Fine,

Director Tuberculosis Division of Newark Health Dep't., Essex County Anti-Tuberculosis Trade Unions; Visiting Phthisologist, Newark City and Newark Beth Israel Hospitals, Newark, N. J.

DURING the past 10 years silicosis as an occupational disease has assumed increasing importance because of the large number of cases appearing in the courts asking for compensation awards for disability from the disease. The subject has become extremely important from the standpoint of its economic significance, and this has led to intensive studies of the disease and its complications. Although "impeded by inadequate definitions based on legal convenience rather than on scientific knowledge," the studies have gone forward until today standards of diagnosis and classification of the various stages of the disease have been developed and accepted in certain parts of the world.

The need for definite standards was obvious upon the presentation of cases for compensation awards, but both industry and physicians have been dilatory in recognizing the necessity of standards for judgment in connection with this disease. Silicosis is widespread throughout industrial populations, and is recognized everywhere in this country as a distinctly occupational disease. At the present time hundreds of damage suits are pending in the courts, calling for meticulous care and judgment if flagrant abuses and injustices are to be avoided both by the person seeking damages and the industrial establishment in which the person allegedly became afflicted. It has already been pointed out that many of these pending cases are fraudulent. The history in those claims which reach the compensation courts is not entirely unreliable in so far as scientific evidence is concerned. It is necessary that two sides of the history should be obtained in every case—the employee's record of actual period of employment and an affidavit as to his complete past employment history—for a most essential feature in diagnosing silicosis is the employment history.

SINCE the meetings at the International Conference on Silicosis in Johannesburg, South Africa, in 1930, many meetings and conferences have been held to clarify the issue of standards and to reduce to a common denominator the essential findings, in order that some basis for adequate compensation for disability from the disease might be arrived at. It has been true too often that persons working in plants in which there is a dust hazard have presented themselves in claims for compensation after a period of "exposure" and have received awards to which they were not entitled according to our best knowledge of silicosis "arising out of and in the course of employment." On the other hand, there have been cases in which the person affected with silicosis did not receive fullest consideration in the judgment rendered.

In determining the validity of claims in silicosis cases a history of exposure to siliceous dust is most important. The diagnosis of the disease should be based upon the complete picture, with the work history as a basic factor, careful attention being given to symptoms, physical, laboratory and x-ray findings. Where doubt still exists practically all simulating conditions can be ruled out by taking serial radiographs every two or three months. The x-ray film when properly taken is of considerable importance from the diagnostic standpoint when it is negative. In the event of death the autopsy with the chemical analysis will invariably allow of definite conclusions.

If the development of silicosis is considered by some a matter of individual resistance (this is at variance with the generally accepted opinion), if no one is immune from the disease, if the

length of time necessary for one to develop the disease is a variable and not a constant (reports from all parts of the world showing variations from less than one year to more than 10 years), if the recitation of complaints by the patient is not considered objective evidence and the physical signs in themselves are not to be construed as diagnostic, the medical examiner is forced to fall back upon what is generally considered the most valid evidence in the determination of the presence or absence of silicosis: namely, a complete study of the case with x-ray findings and with special caution in the matter of differential diagnosis. The variation in the time it takes to produce typical silicosis is due to the variation in the amount and degree of silica dust exposure, as has been pointed out by various authorities.

The pathology of silicosis may be stated briefly as follows: silicosis is essentially a chronic fibrosis of the lung due to breathing air containing silica (SiO_2) and characterized anatomically by generalized fibrotic changes and the development of miliary nodulation in both lungs, and clinically by shortness of breath, decreased chest expansion, lessened capacity for work, absence of fever, increased susceptibility to tuberculosis (some or all of which symptoms may be present) and by characteristic x-ray findings. The dust cell or macrophage which is derived from the walls of the capillaries and lymphatics plays the dominant role. Some of these dust cells are expelled through the respiratory passages, but others have been traced through the entire pulmonary lymphatic system. The dust cells carry the particles of silica to the lymphatic deposits along the alveolar ducts. They may stop here and cause a cellular proliferation choking up the lymphatic channels and producing an anatomical nodule not unlike a tubercle. Some migrate to the lymphoid deposits along the bronchiolcs and bronchi and others pass to the pulmonary lymph nodes. In any case, the sequence begins with a choking of the lymphatic channels, with subsequent fibrosis.

The pathogenesis thus far described results in a nodular fibrosis.

Where the macrophages leak through the lymphatic channels they may invade the interalveolar tissue and interlobar septa and produce an intestitial fibrosis. Thickened pleura, adhesions, nodulations of the pleura and even pleural effusions result from the blocking of lymph flow in the subpleural lymphatics. Nodulations in connection with the pleura are always limited to the visceral pleura.

IN THE FIRST stage of silicosis we find an enlargement of the hilum shadows and an increase in the peribronchial marking of the lung, especially in the lower lobe. The hilum shadows are more extensive and denser in appearance. The peribronchial markings may well extend into the periphery of the lung. This picture may not differ from other chronic respiratory inflammations. The same is true of acute and chronic bronchitis, passive congestion due to cardiac decompensation, irritant gases, and other conditions. This thickening of the bronchial tree is seen in so many conditions that we are forced to the conclusion that it is the result of successive inflammation, or irritation of the bronchial tree.

If repeated colds, acute infectious diseases influenza and toxic reactions to foci of infection elsewhere in the body can produce accentuations of the hilum shadows, we are indeed confronted with an obscure and difficult problem when an early case of silicosis presents itself. The more careful one is with the history the larger the number of etiological possibilities. A worker, who, after two years of alleged exposure to silica dust, gives a history of successive respiratory infections for years, should prove conclusively and beyond a reasonable doubt that his condition is due to the inhalation of silica dust before compensation is awarded.

THE International Silicosis Conference in 1930 divided the disease in three stages. The first or anti-primary stages are those which show the earliest detectable physical signs. The capacity for work may or may not be impaired. The roentgenological findings are as described above.

The second stage is the primary stage. Here one finds definite physical signs of silicosis and capacity for work is impaired.

In the third stage or secondary stage, in addition to physical signs, the capacity for work has been seriously impaired and tuberculosis may or may not be concommitant with it.

In the second stage, the x-ray picture shows the lung mottled throughout due to the fibrotic nodules. The process, beginning with the hilum becomes more or less generalized. The linear markings of the first stage now show a segmentation. The hilum shadows are now less pronounced. The diaphragm is usually not involved.

In the third stage, some of the nodules coalesce and the fibrosis becomes patchy. The

hilum shadows again become heavy. The pleural lymphatics become blocked and the pleura thickened. In this stage diaphragmatic movements become limited.

From this division of silicosis into its legal stages, and what has been sketched as the essential features of each stage, it will be obvious that the differential diagnosis is difficult, not alone in the first stage but in the later stages as well.

From the description given, when the second stage resembles a miliary tuberculosis, the diagnosis is difficult. The history, as pointed out, is of little avail. The symptoms are mild and may go for pneumoconiosis as well as for miliary tuberculosis. Fine distinctions of the plates are fraught with danger in a compensation court. Serial roentgenological plates may be of distinct service.

Miliary carcinomatosis may resemble this stage and the transition into the third stage. The differential diagnosis here is somewhat simpler because the nodules are larger in size and much denser. The finding of a malignant focus is important. The inhalation of corrosive gases may produce a picture of fibrosis exactly similar to this.

The third stage should be differentiated from the old fibrous tuberculosis, chronic interstitial pneumonia, localized pleurisy and multiple lung abscess. As a rule, the history, physical findings and roentgen plates are sufficient to establish a definite diagnosis. One should be careful, however, in certain instances, because the pictures are often not unlike.

The greatest difficulty at this stage is encountered in differentiating between an old tuberculous lesion and silicosis, especially when it is known that tuberculosis most commonly develops at this stage. Our experience indicates that the incidence of tuberculosis was much lower than that of 20 to 25%. Hayhurst and his workers in the *Journal of Industrial Hygiene*, September, 1929, have shown that among 912 men engaged in the largest and deepest sandstone quarry districts in the world, the incidence of tuberculosis was 1.9%. This percentage is no higher than that of the rest of the community. Of the 260 men who had silicosis, 13, or 5%, had tuberculosis. Our statistics approximate this figure more closely.

Active tuberculosis of course involves lung tissue and causes caseation. Old tuberculosis with fibrosis is more difficult and although it produces less fibrosis as a rule, such is not always the case. Again, here, history, physical signs and roentgen plates are not conclusive.

THE MOST obvious solution of the problem is a more thorough check-up of all men who are about to engage in a dusty trade. At this time, a detailed history of respiratory infections, a careful physical examination and an x-ray plate should be taken routinely with every man to be employed for the first time. The changes which would subsequently develop would be evidence of a convincing nature. This would obviate, I am certain, much litigation which is now pending. It would take away much of the uncertainty of diagnosis, and act as a weapon against unjust claims.

Although it is usually considered to be a progressive disease, patients with silicosis at an advanced stage have been seen by Jarvis to improve with several months rest. Films taken at subsequent dates have shown a marked regression and almost complete disappearance of the condition. In evaluating a just compensation to a victim, this consideration must not be lost sight of.

In summary, therefore: (1) Histories in court cases are generally unreliable. (2) Even the diagnosis by x-ray is often questionable. (3) Too often awards are granted without due consideration to other etiological factors. (4) The incidence of tuberculosis among silicotics is probably around 5%, rather than 20 to 25%. (5) Detailed histories, careful physical examination and an x-ray plate as a routine before any man is engaged in a dusty trade will do much for the adjustment of compensation claims. (6) Silicosis is not always progressive and this should be taken into consideration of all claims.

Compensation In Denmark

THE DANISH Act of May 20, 1933, relating to compensation for industrial accidents, which came into force on October 1, 1933, provides also for compensation for a number of occupational diseases.

These include, in addition to those covered by the convention on this subject adopted by the International Labour Conference in 1925 (lead poisoning, mercury poisoning and anthrax), chronic and recurrent skin diseases due to exotic woods, and lung diseases due to inhalation of dust from stone and ores in eight specified industries. The Act does not cover skin diseases caused by certain products which were included in the original bill—*Amer. Jour. Pub. Health* (Oct. '33).

Dislocation of the Patella

—Rather Uncommon in Industry, but Important Enough When It Occurs—

by

GEO. G. DAVIS, M.D.
Chief Surgeon
Illiñois Steel Company
Chicago

TRAUMATIC DISLOCATION of the patella is very uncommon. There are only two classes that are of clinical importance; the rotary and the outward.

Rotary Dislocation

THE PATELLA, as a result of external violence, may be rotated either on its vertical or transverse axis. Rotary luxation on the vertical axis is the more frequent type and may result either from external violence or muscle action. The rotation may be in either direction and of any degree without lateral displacement. Or the patella may be dislocated upward and laterally or medially. The rotation may be inward or outward through a right angle (Fig. 1) or in either direction through 180°. The accompanying pathology is generally confined to damage to the capsule.

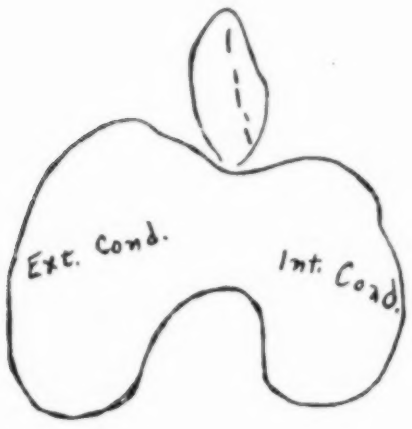
Symptoms and Diagnosis: The leg is held in extension and in the knee joint region there is pain which is the result of two factors; one, the external violence and the other, the tension of the ligaments from the malposition of the patella. The palpating hand may differentiate the articular surface and the flat anterior surface of the patella. Cotton mentions dimpling of the skin corresponding to the front surface, resulting from the close connections of the patella, fascia and skin. The lifted edge of the quadriceps tendon is a guide as to the direction the rotation has taken. Also, the comparative ease of rotation in one direction or the other as gentle attempts to reduce the luxation will be of diagnostic help. In total or subtotal rotation the quadriceps is twisted to a cord and may still show a guiding edge. This palpable edge is of diagnostic value as the rotation more often is subtotal than total and is never beyond 180°. The side at which the quadriceps tendon is prominent indicates that, that side of the patella has been rotated out (anteriorly).

Reduction: With full or hyperextension of the knee and flexion of the hip to relax the rectus femoris, the dislocation is reduced by forcible rotation applied with thumb and fingers to the patella. At times slight flexion of the knee joint aids reduction. If by manipulation the reduction is not successful, an open operation is indicated.

Rotary luxation of the patella on its vertical axis (Fig. 2) may result from external violence but probably never from muscle action. This luxation is seldom encountered. Up to 1905 Cheesman was able to find but five reported in the literature. His was the sixth. This was a boy of 13, who had been thrown from a moving train. The patella could be felt projecting straight forward from the space between tibia and femur. The fingers inserted above it entered the joint cavity only skin and superficial tissues intervening. The leg was readily flexed and extended. Efforts to lift the patella out of its false position failed. The patella moved slightly laterally, and its engaged superior border could be felt to grate on the cartilaginous surfaces of the bones, but it could not be lifted out of its insertion between them being held there, he thought, by the stretched ligamentum patellæ and the fibres of the joint capsule. It was judged that the quadriceps tendon must be ruptured, thus permitting the fingers to dip deeply into the joint above the displaced patella, and allowingg full flexion of the leg.

Under ether, a large semicircular flap, convexity upward, was turned down, exposing the tendinous structures of the knee. A longitudinal opening made in the joint above the patella gave exit to much blood and serum. The joint cavity was irrigated with hot saline solution till clean. All efforts failed to lift the patella from its lock in the joint by hands and by lion-clawed forceps. But through a slit near the ligamentum patellæ, the curved end of a blunt dissector was introduced under the patella, as indicated in Fig. 2, and the bone pried out of its engagement in the joint, whereupon it leaped suddenly into normal position. The upper edge of the patella was now seen to be completely severed from the quadriceps tendon. No particle of the tendon remained attached to it, but some bony fragments torn from the knee-pan remained attached to the tendon. The joint cavity was washed out and the separated tendon sutured by chromatized gut to the periosteum and aponeurotic fibres of the

patella. Other divided structures were united and the large flap brought into place by a subcutaneous catgut suture, a few strands of silkworm gut suture being left in the lower end of the incision on either side of the joint as a drain. In a little over two months recovery of all motions was complete.



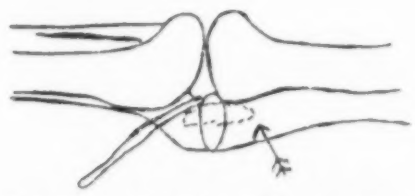


Fig. 1. (Left) Illustration of dislocation of the patella with rotation on its perpendicular axis showing the bone revolved through 90°, one or the other lateral edge resting in the groove between the femoral condyles. Illus. by Cheesman.

Fig. 2. (Above) Illustrates dislocation of the patella with rotation on the horizontal axis, showing the bone wedged in the notch between the tibia and femur. Illus. by Cheesman.

He explains the mechanism of the injury by stating that whether the leg were flexed or extended, force delivered in the direction of the arrow (Fig. 2) at point of attachment of quadriceps tendon to the patella could sever this attachment, turn the patella on its horizontal axis, and continuing, push its freed upper border downward into the notch between the femur and tibia, where it would be locked by the patellar ligament and the capsular fibres stretching like guy-ropes of a tent in all directions.

In a review of the cases taken from the literature, in only one case, that of Deaderick's (*Annals Surg.*, 11, P. 102, 1890) was reduction accomplished by manipulation. All of the operative cases healed by primary union.

Anderson reports two cases not mentioned by Cheesman in which he flexed the joint about 40° and manipulated the patella, thus reducing the dislocation easily. He believes the greatest element of success consists in pushing the anesthetic until it vanquishes the resistance of the quadriceps extensor; and as adjuncts the movement of flexion with rotation, he considers to be more efficacious than simple extension, and possibly because it draws upon the margins of the twisted bone through the intermediation of the stretched tibio-patellar bands. Ewing got on his knees, with the patient's leg on his shoulder, hands on patella, thigh flexed on pelvis, and, with very little pressure, the patella turned back in its place. He believes the patella is not dislocated, except when the leg is extended and the thigh flexed.

Hotchkiss's patient sustained his injury while holding on to some ropes with the left hand, and additionally supported by twists or ropes around his left leg. As these passed the knee they were bearing against the inner side of the patella. While in this position, he attempted with the other hand to cast a rope clear; in order to reach high enough, he made a violent extensible effort of the leg, which dislocated the patella. Only when under full anethesia with thigh flexed, and by a sudden powerful over-extension of the knee, while two thumbs were bearing against the bone, was reposition effected. Kennedy effected easy reduction by slight pressure on the outer edge of the patella, once complete relaxation of the quadriceps extensor muscle had been obtained.

The patella in Farmer's patient was avulsed from the quadriceps tendon and rotated vertically downward until the upper border dropped in between the tibia and femur. In this position no manner of manipulations could release it; but with the joint opened it was a simple matter to rotate the patella back to its normal position.

This patient, a boy of 11, while riding a bicycle, was struck by an automobile and was thrown in such a way that he struck his left knee with force against the ground, on the anterior

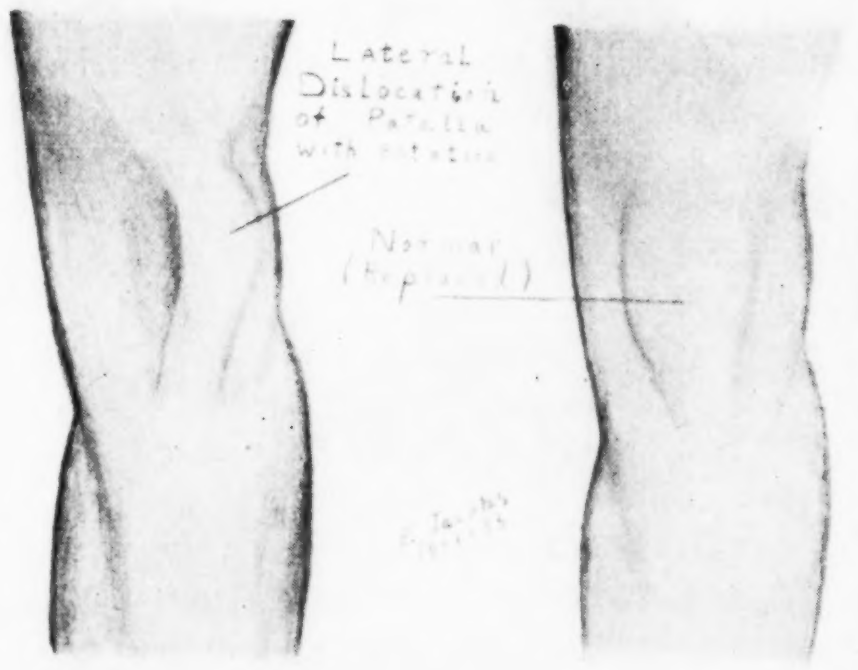


Fig. 3. A drawing of the writer's case showing at the left, the lateral dislocation of patella with rotation, and, to the right, the normal appearance after reduction. The drawing by E. Jacobs.

aspect above the patella in a downward direction. When the blow struck the quadriceps tendon, Farmer believes the quadriceps muscle was stretched until the patella slipped down to a point where it no longer had the support of the femur behind it, and it then burst out of the tendon and lodged in the intercondylar fossa. When the force was removed, the quadriceps tendon sprang back to the normal position, but

the patella, now attached to nothing but the ligamentum patellæ, remained behind.

Outward Dislocations

TRAUMATIC outward dislocations of the patella onto or beyond the ridge of the external condyle is seen rather infrequently. Violence acting directly on the patella from the inner side usually causes the dislocation; however, it may result from sudden muscular action in a knock-knee person or when there is deficient development of the external condyle. Kleinberg encountered such a case in a patient who had had anterior poliomyelitis as a result of which there was flexion deformity of the knee, weakness of the quadriceps muscle, shortening of all the soft tissues of the outer aspect of the knee and thigh, a marked knock-knee and a fixed outward rotation of the leg. He states four factors commonly predispose to an outward dislocation of the patella: (1) Laxity of the quadriceps muscle; (2) contracture of the iliotibial band and the external lateral patellar expansion of the quadriceps aponeurosis; (3) underdevelopment of the lateral condyle of the femur, permitting abnormal outward mobility of the patella; and (4) outward rotation of the leg. Any one or all of these conditions may be involved in the mechanism of any given case of outward dislocation of the patella.

Winslow reviews the recent literature on complete outward dislocation. He accomplished reduction by manipulation. More recently, Huff reports a similar case in a man 45 in whom nitrous oxide anethesia was necessary when the right hip was flexed on the abdomen, and with hyperextension of the knee, the patella was slipped back into normal position with ease.

Fig. 4. X-ray of writer's case, showing lateral and upward dislocation of patella with partial rotation. There is a slight crushing fracture of the upper part of condyle where lower portion of patella was wedged against it.

Case Record

ON SEPTEMBER 19, 1933, this patient received an injury to his left knee joint region by a force applied to the back part of his knee from a truck that was being pushed by a tractor. The anterior portion of his knee joint was wedged against a solid obstacle and in this manner the dislocation occurred. He had considerable pain in the region of the knee joint and inability to flex or extend his knee joint. The patella was dislocated laterally and twisted the anterior surface medialwards and the posterior surface lateral-ward. F. W. Merritt, who saw the case at the time of entrance to the hospital, by manipulation with the fingers and thumb rotating the patella one way and another, at the same time hyperextending the leg, was able to reduce the dislocation. An x-ray examination showed that the patella was lodged and impacted above the lateral condyle, causing an impacted fracture.

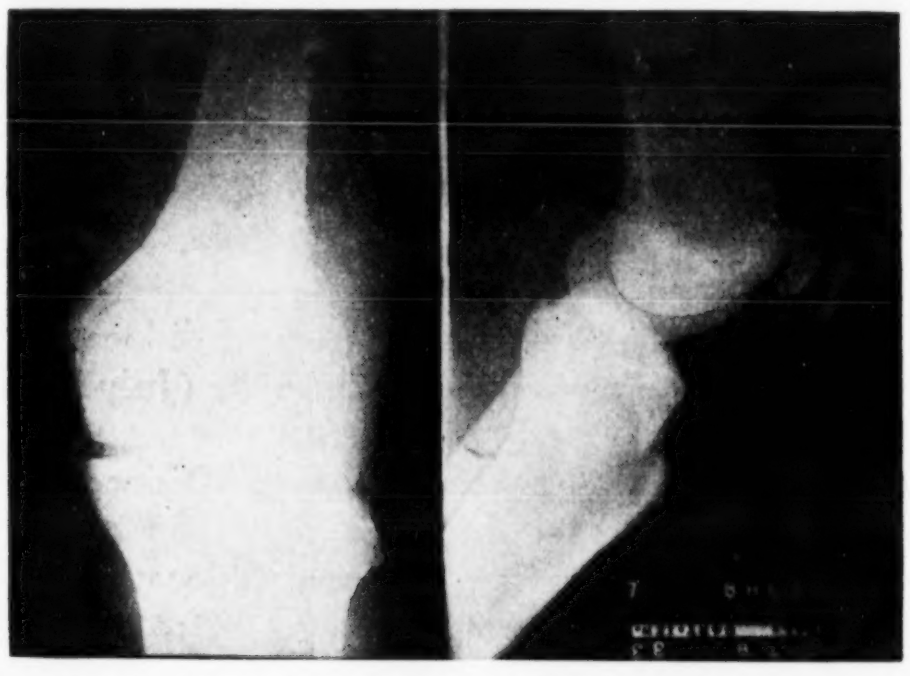


Fig. 5. X-ray of writer's case, after reduction, showing a gouged out appearance of the upper portion of outer condyle where the lower portion of the patella had been wedged against it.

No anesthetic was necessary to reduce the dislocation.

Ice pack was applied and the patient made an uneventful recovery and a work slip was given October 25, 1933.

The impaction noticed in this case is quite similar to the pathology of impaction mentioned by Kleinberg in his case.

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Seven Wonders of Medicine

DR. BOWMAN C. CROWELL, associate director of the American College of Surgeons, at a community health meeting held in St. Louis during the recent annual session of the college, listed the seven wonders of medicine as follows:

(1) Immunity or resistance to diseases; (2) anesthesia and analgesia giving relief from pain; (3) antisepsis preventing wound infection and blood poisoning; (4) knowledge of vitamins and food values; (5) light and ventilation; (6) organotherapy such as feeding liver to pernicious anemia patients, giving insulin to diabetics, and thyroid gland extract to cretins; and (7) periodic health examinations to prevent the effects of certain diseases such as cancer.

Oblique Hernia and Workmen's Compensation Laws

By Robert M. Toll, M.D.
Assistant Surgeon
Coney Island Hospital

WITH THE development of modern industrial insurance the status of hernia as a compensable accident has become a matter of great importance. This status is not yet fixed.

Hernia is the protrusion of a viscus through an opening in the wall of the containing cavity. For the purpose of this discussion only the oblique inguinal type will be considered since this type constitutes 90% of hernias encountered in industry.

Hernia as an industrial and compensable accident revolves finally on the effect of trauma in its causation, or better, its manifestation.

Wainwright, after a survey of the American, English, French and German literatures, finds that medical opinion is practically unanimous that oblique hernia results from a congenitally preformed sac. From the standpoint of workmen's compensation boards, however, the issue is different. Even if a man has a congenital sac he may go through life without any actual hernia developing in it. A sac without contents is not a true hernia. The status of trauma in the conversion of the empty sac into a true hernia is still a moot question. The extremes of opinion range from surgeons who claim that only hernias due to direct violence are compensable, to compensation boards that regard all hernias as compensable. The former are not entirely fair to many employees, the latter do an injustice to employers.

In 1908, before workmen's compensation laws had been adopted, Coley reported a series of 4797 cases in males over 15 years of age. Of these, 3102 appeared gradually without any known exciting cause. In the remaining number the following exciting causes were elicited:

Lifting or carrying a heavy weight	1015
Coughing and sneezing	150
Push, fall or twist	27
Fall from a height	89
Slipping	34
Blow in the groin or abdomen	40
Kick	8
Running or jumping	20

In the cases of the first group, comprising about 70% of the total, it can be safely argued that a congenitally preformed sac existed, this sac became gradually dilated by normal increases in intra-abdominal pressure consequent on the daily routine of life, contents entered the sac and a hernia appeared. In the cases of the second group, about 30% of the whole, an exciting cause is given. It is fair to assume in most of these some relation to cause and effect.

In the early years of the compensation laws certain postulates were proposed by medical men to be proved by the claimant before he was entitled to compensation. These embraced:

1. Descent immediately following the cause.
2. Severe pain in the hernial region.
3. Prostration, so that work is stopped at once.
4. Symptoms so severe as to be reported to the employer within 24 hours.
5. Such distress that a physician is required within 24 hours.
6. Adequate force.

For our purpose hernias may be classified into two groups:

I. (a) Hernia by direct violence. These occur rarely —one to four per 1000. There is no question of their compensability.

(b) Hernia of force—due to muscular effort, appears suddenly and immediately under adequate and convincing circumstances and meets the postulates noted. Compensability cannot be successfully questioned.

II. Hernia of weakness—appears shortly or remotely after trivial effort. The contention here is that the last blow is responsible. Most cases come under this head and furnish the greatest number of claimants.

Opposition to compensability is levelled against this group. The reasons for this stand are thus summed up by Wainwright:

1. The postulates are absent.
2. The hernia was always present, the alleged injury only calling attention to it.
3. If the injury did force viscera into the waiting sac it was merely a further stage in a naturally progressing process and not a new condition.
4. If it is admitted that the hernia was made larger by the strain no new condition is created.
5. The result to receive attention must be immediately present. If a sudden hernia is noticed several days after the alleged injury there is no proof, no evidence, and even no probability that the injury had anything to do with it.

The position taken by most industrial boards is in the main summed up by Chairman Walnut of the Pennsylvania Commission: "The terms injury and personal injury are construed to mean violence to physical structures of the body and such disease or infection as naturally result therefrom. This violence need not necessarily be external force. It may include voluntary strain greater than the body could bear in the course of employment. The strain need not be unusual—it is the unusual and unexpected injury resulting from a particuar strain that constitutes the accident."

However it is still possible on occasion successfully to controvert compensability on the clinical record. Here the history is of great importance. It should note the usual work and usual effort; nature of the force at the time of injury; attitude at the moment of force; immediate results (pain, vomiting, collapse); evidence of witnesses.

These points will be of help in determining the age of hernia:

	RECENT	OLD
GROSS FINDINGS.	1. small — not bigger than hen's egg.	1. large or scrotal—rare under one year.
	2. sometimes not reducible. If reduced may not be produced at examination.	2. slips back easily and returns with slight cough.
	3. ring little different from good side, edges sharp.	3. ring large, admits thumb or two fingers, edges ill defined.
	4. firm abdomen.	4. lax abdomen.
	5. no undescended testis, no operative scars, no evidence of truss.	5. any of these may be present.
OPERATIVE FINDINGS.	1. sac thin, non-adherent.	1. sac thickened, adherent, may show white dense ring at internal ring.
	2. contents not adherent to sac, no omentum in sac.	2. contents adherent to sac, omentum present.
	3. blood, edema. etc., of acute trauma (rare).	3. no objective signs of acute trauma.
	4. no displacement in relative position of rings.	4. external ring may be immediately anterior to internal.
	5. musculature firm.	5. weak, atrophic musculature.
	6. fascia taut.	6. spreading fascia.
	7. tissue planes separate easily.	7. tissues matted together.

Strangulation of an existing hernia falls into the same category as hernia by direct violence and is compensable.

Recurrences after radical operation are not common. Coley reports 5% in a series of 8589 cases so treated. When they do occur, whether from new injury or by gradual development, they are back to their original status and are compensable.

Cost of operation and hospital services are provided and disability compensation paid for a period varying from seven to 17 weeks.

In strangulated hernia the injured can refuse operation, and if he dies compensation must be paid the same as for death from accident. The decisions have favored the injured in this regard.

The complications incident to surgery are compensated for as if the direct result of the accident.

In most states the law leaves to the industrial boards entire discretion as to what determines casual relation. In 11 states the conditions set down in the law are apparently more rigid—sudden effort, immediate descent, pain severe enough to be reported to one or more persons. In New Jersey the law is specifically designed to pay for only a very small percentage of hernias. Here the claimant is balked by the requirement of prostration which has been interpreted by the courts to mean complete collapse. But even here the commissioners have begun to liberalize their decisions while many employers have voluntarily offered relief, both surgical and monetary, though free from responsibility under the law.

The present medical attitude toward the definition of traumatic hernia has become much broader. It is, in the main, that of Coley, et al., representing the American Railway Association: "We would define traumatic hernia as a hernia resulting from the direct application of force to that portion of the abdominal wall at which the hernia appears, or a hernia resulting from the indirect application of force causing greatly increased intra-abdominal pressure. Whether the hernia follows the natural openings in the abdomen or not, or creates a new passageway is immaterial."

They advise physical examination of all applicants to determine the presence of hernia at the time of examination. Any hernia developing in the course of duty is to be treated as a disease due to anatomical weakness. The moral obligation in these cases to be limited to those employees found free of hernia at the time of examination.

In Summary: the hernia problem as an industrial accident remains one of constant interest and uncertainty to both surgeons and industrial boards. While a percentage of hernias are admitted to be of undoubted traumatic origin, a vast number without compensable basis slip by on the strength of the former. Postulates in the law or promulgated by boards tend to sift out some of these.

Strangulated hernia and recurrent hernia are compensable, as are the complications incident to surgery.

Present medical opinion is as defined by Coley. While the congenital factor is conceded, the employer is not relieved from liability. The claim for aggravation or acceleration of a pre-existing condition remains. The term accident and its resulting effects are liberally interpreted by industrial boards. The appearance of symptoms (pain, swelling, etc.) following any incident in the course of employment is regarded as competent casual relation.

The present trend is to regard oblique hernia as an occupational disease especially affecting workers engaged in heavy manual labor. Here responsibility has been voluntarily accepted by many employers in providing relief to those workers who developed hernias while in their employ.

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Derangement of the Semilunar Cartilage of the Knee

By E. B. MUMFORD, B.S., M.D.
Indianapolis, Indiana

THE COMPLEX character of the knee joint with its many elements of structure make possible a large variety of pathological conditions which may arise from trauma, infection, and constitutional diseases, and the differential diagnosis in many instances is most difficult and finally depends upon the findings through an exploration of the knee joint.

The discussion at this time will be limited to the disabilities which follow injuries to the semiluner cartilages as they are perhaps the most common in all types of practice and are also the most frequent factor in "chronic" knees. An early diagnosis with appropriate treatment will prevent the pathological changes in the other structures and tissues in and about the joint, changes which may become so extensive as to be beyond repair and thus create disabilities which are permanent.

The knee joint is of the hinge type but there is also some lateral motion and some rotation between the femur and the tibia. The stability of the joint is dependent upon the ligaments and the muscles through their tendons. The joint cavity is divided into an anterior and a posterior chamber between the ends of the femur and the

tibia and extends upward above the patella and beneath the quadriceps tendon for a considerable distance. The synovia which is intimately connected with the capsule lines the entire joint with the exception of that part of the bones which is covered with the articulation cartilage. It is reflected over the free upper and lower surfaces of the semilunar cartilages.

The semilunar cartilages, internal and external, are closely attached to the capsul along the outer surface, and indirectly they are loosely attached to the lateral ligaments in their anterior half through the capsule. They are firmly attached at the anterior and posterior ends to the tibia. The purposes of the semilunar cartilages are to deepen the superior surface of the tibia for the reception of the rounded femoral condyles and to sustain a portion of the shock of the

Semilunar cartilages of the knee showing extensive tears

body as a whole. When the knee is extended the menisci are pushed outward and with a spring-like action go inward as the knee is flexed. This motion is made possible as the cartilages are not attached firmly to the top of the tibia. There is a fairly rich blood supply to the menisci and to the infra-patellar fat pad which is closely associated with the anterior ends of the semilunar cartilages.

The internal semilunar cartilage is injured much more frequently than the external cartilage (ratio of 10 to one). This may be due in part to the more intimate attachment of the internal meniscus to the lateral ligament but largely because the strains thrown upon the knee joint are most frequent on the medial structures. The exact mechanism which injures the cartilage is not clearly understood, but the most reasonable explanation is that as the femur is rotated inward upon the fixed tibia and the knee is bent inward the attachment between the cartilage and the stretched capsule and the lateral ligament is lessened. The cartilage is thus not drawn outward when the knee is brought into extension and becomes caught between the tibia and the femoral condyles and pinched. In some cases apparently the cartilage has exerted upon it either a sudden and overacting stretching which either tears it loose from its anterior attachment to the tibia or in its middle portion, and in extension this loose part of the meniscus becomes pinched. Direct trauma is rarely a factor in cartilage injuries. Regardless of the manner of the production of the lesion the initial injury is perhaps slight and the extensive damage found at operation is the result of subsequent injury to the loosened or split cartilage.

THE HISTORY is that of a sudden acute pain in the knee when an attempt is made to straighten the leg. The patient may be in a stooped position and upon getting up have the pain appear. A misstep off a curb or a fall into a hole with an inward twist of the femur upon the fixed lower leg or the forcible bending inward of the knee with a twist of the body when the foot is fixed as occurs in a football tackle are common histories in this type of lesion. In all cases there is a history of the knee being in some degree of flexion and the pain coming when an attempt is made to extend the leg at the knee. This pain may be acute only for a short time and after a few manipulations or steps the patient may be able to walk or continue with his work or sport. On the other hand, there may be a definite locking of the knee in that the joint cannot be fully extended or flexed and is held within a small range of motion. Following the initial lesion the knee becomes swollen and is sore for several days. If healing is not complete, the patient has a recurrence of the attack with only a history of a very slight twist such as a sudden turn or a step from a curb. These recurrences may become more frequent and often with less pain, but the swelling persists longer and the soreness of the knee may be con-

stant. A sense of fear of an impending attack may also develop and the patient give up some of the sports. The majority of the cases occur in persons between the age of 20 and 30 years.

THE SYMPTOMS and signs are pain, swelling, locking, slipping of the knee, weakness, limitation of motion, crepitus, atrophy of the thigh, and palpation of the meniscus.

PAIN. The pain is a constant symptom both in the initial and in the subsequent attacks. Acute in character, it may be referred to the entire knee, or to any part of the knee. Most frequently, however, it is found along the inner joint line over the area of the cartilage. Tenderness to pressure is also in this same region and but rarely over the attachment of the lateral ligaments to the condyles of the femur. The pain may be referred to the popliteal space.

SWELLING. The swelling is due to an increase in the joint fluid rather than to a localized hematoma. Aspiration of the joint immediately following the initial attack will show the joint fluid to be bloody or blood tinged. Following the subsequent attacks it is usually a clear straw-colored fluid and is due to an irritation of the synovia. In the chronic cases the swelling may be constant but varying in degree as the synovia becomes hypertrophied or loose bodies form.

LOCKING. Locking of the knee occurs in about 50% of the cases. It may in an individual case be present only at the time of the initial attack, or it may occur frequently in the subsequent recurrences. The locking occurs with the knee in a position of about 30° flexion and is the result of the impingement of the cartilage between the tibia and the condyle of the femur.

SLIPPING OF THE KNEE. Not infrequently there is a history of a slipping of the knee which the patient may think is a dislocation of the knee as a whole or of the patella. This point in the history is often confusing, especially in women in whom recurrent dislocations of the patella are not uncommon. A dislocation of the patella will not give the tenderness along the joint line but along the outer edge of the patella as it is pushed outward against the condylar ridge. There is also a lack of history of locking, and the pain after the dislocation is reduced is not severe. In one case of the writer the patient sustained an injury to the internal meniscus at the time the patella dislocated, and the meniscus was removed at the same time a plastic operation was done on the patellar ligament.

WEAKNESS. As the case becomes chronic there develops a weakness in the knee which is most noticeable after any violent or prolonged exercise or in going up stairs. This weakness is due in part to the periarticular changes but perhaps more as a result of the instability of the knee resulting from the atrophy of the quadriceps muscle.

LIMITATION of MOTION. Other than the locking of the knee there may be a limitation of motion in full extension and in full flexion. The latter is not a cause of much complaint, but the inability fully to extend the knee is noticeable in standing and especially when lying in bed as the patient cannot keep the leg straight.

CREPITATION. Crepitation of the knee indicates a thickening of the synovia with perhaps some villous formation or loose bodies or an hypertrophy of the fat pad. It is found only in the chronic cases.

PALPATION OF THE MENISCUS. This is a rare sign but often the patient will state that he can feel a body along the joint line slide in and out of the joint.

ATROPHY OF THE THIGH. This is an extremely important sign and indicates some derangement within the knee, either an injured semilunar cartilage or a loose body. It is not characteristic of hypertrophic or atrophic arthritis. The atrophy may appear quickly or come on gradually. An examination of the thigh will show a marked softening or flabbiness of the muscles and measurement in the lower third will demonstrate an actual diminution in the circumference as compared with the opposite thigh. It is not an atrophy of disuse but is an imperfect and poor protective or defensive reflex action to put the knee at rest. Church, in his book on Nervous Diseases, is quoted as follows: "Arthritis of any character may be followed by extensive atrophy of the muscles above the joints, principally those of extension. This arthritic muscular atrophy in which the muscles waste but conserve the electrical and reflex responses is attributed to an irritant condition which arises in the inflamed joint. It affects the trophic spinal centers and thence acts upon the nutrition of the particular muscles physiologically associated with that joint. It is positively known that division of the afferent path from the inflamed joint to the spinal center prevents the atrophic sequel." The gravity of this atrophy of the thigh lies in the lessening of the natural stability of the knee joint which is due in a large part to the strength of the muscles and

tendons about the knee. With this decrease in stability a greater strain is thrown on the other structures of the knee, resulting in weakness and in soreness. This change in the quadriceps also interferes in the ordinary motion of the leg as a whole, especially in such acts as climbing stairs. In some cases the atrophy is extreme and many months or years are required for building up the normal tone and size of the muscle group. It is an important factor in estimating the permanent disability.

Treatment. The treatment of an injury to the semilunar cartilage is either conservative or operative. In many cases an exact diagnosis is often difficult and the amount of damage done to the cartilage at the time of the initial lesion is not always indicated. Conservative treatment is indicated in practically all cases following the initial lesion. If the knee is locked, or if full extension is very painful, an attempt should be made to reduce or replace the cartilage through some manipulation. The method suggested by Jones is perhaps the most satisfactory. If an anaesthetic is not used the surgeon grasps the lower part of the tibia with one hand, the lower part of the thigh with the other. The knee is flexed as far as possible. The patient is then told to attempt to extend the knee on the count of three and at the same time the operator with considerable force brings the knee into full extension and at the same time rotates the tibia inward and the thigh outward. This will cause considerable temporary pain, but if the manipulation is successful in restoring the cartilage to its proper position the patient can extend the knee with but little or no discomfort. It may be necessary to repeat that manoeuver under an anaesthetic. The leg is then fixed with a light plaster of Paris splint, with the leg fully extended. Weight bearing can be permitted with the use of crutches or a cane for four weeks, following which massage to the thigh muscles, heat to the knee, and care in exercise should be used. An added protection to the knee can be obtained in elevating the inner border of the shoe one quarter of an inch. In a majority of the cases this simple conservative treatment will give a complete cure.

If there is a recurrence of the symptoms, or if the knee continues to be sore and the swelling does not disappear, one can assume that the cartilage has not become firmly fixed in its original position or that it is torn and acting as a foreign body. The x-ray is not of any value in demonstrating an injured cartilage but inasmuch as the symptoms from a loose body (joint mouse) simulate very closely those of a cartilage injury, an x-ray study should always be made before a final conclusion as to the pathology has been reached. An exploration of the knee is then indicated.

Before operation the knee and adjacent parts of the thigh and leg should be shaved and thoroughly scrubbed with soap and then cleaned with alcohol and then ether and the field wrapped in a sterile towel. This first preparation is done the day before and repeated the day of the operation. A tourniquet is applied at the upper portion of the thigh. The skin is painted with iodine to outline the sterile field and the knee is draped so that it may be flexed over the end of the table.

The line of incision varies with the operator. For many years a short lateral incision was used and then later the split patellar approach of the patella was suggested and still later the para-patellar or long lateral incision was advocated. The para-patellar incision is preferred, as it gives a better view of the knee joint as a whole. Not infrequently there is associated with the cartilage injury other pathology such as a loose body, thickening of the fat pad, tear of the crucial ligament, villous formation of the synovia and fibrinous pannus over the femoral condyles. In three cases in which the short lateral incision of Jones was used the writer failed to observe loose bodies and a second operation was required.

The para-patellar incision begins above the patella about one inch and is carried down and around the inner side of the patella to the tubercle of the tibia. The capsule is then opened and the amount of joint fluid noted. Retracting the patella outward, the inner cartilage is easily seen and hyper-mobility or tearing is observed. The cartilage is loosed at its anterior end and grasped with a forcep and with a sharp small knife cut from the capsule. It is possible to leave a small fringe or border of the cartilage attached to the capsule. It is not possible nor is it necessary to remove the entire cartilage, a small tag being left at the site of the posterior attachment. A search is made then of the rest of the joint cavity and any loose bodies or hypertrophied portions of the synovia removed. The wound is filled with ether, the capsule sutured with interrupted sutures of Plain No. 0 catgut, the other layers sutured with No. 1 catgut and the skin closed with silk or dermol. A firm compression bandage is applied over the dressings and a light plaster splint used for fixation. The tourniquet is then removed.

The post-operative care varies from fixation for three to four days to 12 or 15 days and first active motion from the fifth to the fifteenth day. Weight bearing may be allowed from 10 to 20 days and return to occupation at the end of the fourth to the sixth week.

Atrophy of the thigh is one of the most frequent causes for a prolonged convalescence. As soon as possible massage of the quadriceps should be started and exercise given for active use of this group of muscles. Arthritis may also be a factor in the persistent pain after operation.

The pathology found at time of operation is often extensive and may involve all the structures of the joint. The repeated irritation to the synovia leads to an hypertrophy and often villous formations. These villi may become detached and form loose bodies. The articulating cartilage of the femur may be covered with a thin, soft, velvety red pannus of fibrinous tissue or if the semilunar cartilage does become a loose body there may be some destruction of the articulating cartilage. The fat pad not infrequently becomes thickened and hypertrophied and the anterior end of the meniscus may be imbedded in the fat pad. The cartilage may be only loosened and show an hyper-mobility. It may be split logitudinally, loosened at its anterior end, or torn partially in the center with the loosened portion curled inward. Bands of fibrous tissue may stretch across the joint from the meniscus to the condyles of the femur. The joint fluid is increased in amount and following the initial lesion is bloody. Cyst or ganglion may be observed in the semilunar cartilage.

SUMMARY: Most cases respond well to conservative treatment following the initial injury. Operative interference is not indicated until no improvement is shown under conservative methods or there have been recurrences of the attacks.

Following operation the prognosis is excellent in about 80% while 10% show satisfactory results and 10% are not improved. By excellent results is meant that the patient is able to resume his former occupation and has no disability. By satisfactory results is meant that the patient is able to resume a greater part of his work or has some discomfort which is not sufficient to cause a total impairment.

The greater the changes found in the synovia the less favorable is the prognosis as some arthritic symptoms will persist.

The restoration of the muscle tone of the quadriceps group is also very important and when persistent will lead to instability, weakness, and pain.

Health Insurance

THERE is but one alternative and that lies in insurance. If and when health insurance comes to be generally adopted, and if it is to avoid the pitfalls and dangers that present efforts along that line have been shown to entail:

1. It must be an insurance only to supply medical care and divorced completely from cash disability benefits.

2. It must be a form of insurance that provides only for the catastrophic costs of sickness, leaving entirely alone all that there is of medical care that can be purchased conveniently by the individual on a fee-for-service basis.

3. It must cover all types of medical care.

4. It must provide freedom on the part of the patient in the choice of his doctor, his hospital, and his nurse.

5. It must be made general by some form of compulsion. Experience indicates that this might be accomplished through cooperation of the industrialist. If this does not succeed, it may be necessary and wise for it to be made compulsory by law.

6. It must be operated and controlled by that medical organization representing the profession of the community—not by the public and not by competing groups within the profession.

7. It must justify complete public confidence by including experienced lay representation and by providing for better control of the quality of medical service given.

Such a limited program of health insurance would take all that is good out of the many schemes of medical practice presently operating and at once be free from their many harms. It would preserve completely that part of the present practice of medicine which is within the patient's ability to purchase and pay for. It would be the means of offering everyone but the absolute pauper a convenient way of assuming the responsibility of the medical care of himself and loved ones. It would allow him to choose who is to be given the responsibility of that care. It would do away with the uncollectible accounts of doctors and hospitals. It would offer to the physician an opportunity of earning a living commensurate with the value of the service he performs.—Dr. James C. Sargent, in *The Wisconsin Medical Journal*, (August, 1933).

Cardiovascular Disease and Industry

—*VII. Trauma; and VIII. Etiology of Heart Failure*—

by

NATHAN SMITH DAVIS, III, A.B., M.D., F.A.C.P.
Assistant Professor of Medicine
Northwestern University Medical School

STRUCTURAL cardiac lesions occur as the result of penetrating wounds, severe strains, severe blows on the chest or crushing injuries." (Criteria for the Classification and Diagnosis of Heart Disease, N. Y. Tuberculosis and Health Association, N. Y., 1932.) "Traumatic myocarditis is one of those indefinite terms that is best used not at all, and there is no literature of scientific value on this subject." (*J.A.M.A.*, 101:19—p. 1503, Nov. 4, 1933.)

It would seem at first glance that these two statements were somewhat contradictory but that is not the case. "Penetrating wounds" due to bullets, fragments of shells, knives, daggers, scissors or other objects when they heal, cause scarring of the myocardium not myocarditis. "Severe strains" may cause an acute dilatation of the heart with serious impairment of function but with little if any permanent organic change. With "severe strains" there may be as is the case in strains of skeletal musclea, hemorrhage in the myocardium which on healing results in a localized fibrosis or scarring but not in myocarditis. "Severe blows on the chest or crushing injuries" may also cause hemorrhage in the myocardium, contusion of the heart, which may result in localized fibrosis or scarring but not in myocarditis. The effects on the heart that result from trauma are similar to the effects of infarction, are local and not diffuse. The term "traumatic myocarditis" which implies a diffuse myocardial degeneration or fibrosis should therefore not be used.

Penetrating wounds of the heart due to bullets or to dull objects usually cause death in a very short time as hemorrhage into the pericardium, "heart tamponade," is associated with such an increased intrapericardial pressure that it is not possible for the heart to function. The situation is similar to that which results from rupture of an infarct, a myocardial aneurysm, or an aortic aneurysm into the pericardium. With penetrating wounds of the ventricles due to sharp slender instruments especially if the instrument penetrates in such a manner that the wound is not at right angles to the surface of the heart, there is little hemorrhage into the pericardium as the intra and extra cardiac pressure keeps the surfaces in opposition. Such injuries may heal spontaneously if nothing happens to markedly increase intracardiac pressure. Penetrating wounds of the auricles are apt to result fatally in a short time as the auricular myocardium is not thick enough to maintain such a valve like closure. Prompt surgical intervention with suture of the wound is indicated in these cases. The operation is often successful and if there is no infection, recovery is uneventful. The great majority of the injuries to the heart are of this type.

Contusions of the heart or hemorrhages into the myocardium may result from severe blows on the chest or from crushing injuries to the chest. These lesions are more prone to arise if the individual who sustains the injury has some sclerosis of the coronary vessels. The heart is suspended in the thorax by the great vessels at its base and normally its position changes considerably with changes in posture. With a sudden blow on the chest whether or not it results in a crushing injury, the heart may strike the anterior chest wall or even the vertebral column with sufficient violence to produce a contusion and hemorrhage into the myocardium. Following such an injury, symptoms almost identical with those that arise as a result of coronary occlusion and cardiac infarction arise almost immediately. Cardiac pain, cardiac arhythmias, and breathlessness are the symptoms most commonly found. Congestive heart failure may develop after a few days.

Severe strains such as may result when the entire weight of a heavy object is thrown on one man when others engaged in lifting it for any reason release their hold, or when an employee is forced for some reason to overexert himself, will as a rule cause little if any permanent damage if the heart and its arteries are normal. If sclerosis of the coronary arteries is present, solitary or multiple myocardial hemorrhages may result. The symptoms are similar to those that result from cardiac infarction.

For the employer, penetrating wounds of the

chest involving the heart are not much of a problem. If they are incurred while the employee is at work, there is no question except as to the degree of disability and its permanence. If crushing injuries of the chest result in contusions or lacerations (from fractured ribs) of the myocardium, the problem is similar to that in the case of penetrating wounds. Severe blows on the chest which may leave no external marks may produce hemorrhage in the myocardium. Such a blow might be incurred in connection with a fall from a ladder or scaffold. But a coronary occlusion occurring while a man was at work on a scaffold or ladder might cause the fall and the resulting disability. It is, however, almost impossible to prove unless at autopsy, whether the fall was the cause of the cardiac pathology or the cardiac pathology the cause of the fall. The sudden onset of a paroxysmal or permanent type of arhythmia might similarly be either the cause of the fall or the result of injury to the heart caused by the fall. However, if the symptoms of heart failure do not arise soon after the injury, it is probable that the "severe blow on the chest or crushing injury" was not the direct cause of the cardiac lesion.

Trauma that does not directly affect the heart may, however, be a contributory cause of the onset of heart failure in older individuals with fairly advanced arteriosclerotic heart disease. It seems that anything that makes necessary almost complete physical inactivity in such individuals may cause the onset of heart failure in the course of a few days or weeks. The classical example of this association of trauma and heart failure is the pulmonary congestion and hypostatic pneumonia that so frequently follow a few days after the fracture of the neck of the femur in old people. It seems that the stimulation of the circulation resulting from physical activity is required if such arterio sclerotic hearts are to continue to function normally. The high mortality following prostatectomies in old men is in part, at least, due to cardiac failure that results from the enforced inactivity following the operation. So any trauma to an individual that results in physical inactivity may be a contributory cause of heart failure if there is an arteriosclerotic heart disease present.

AS JUST STATED, enforced physical inactivity may be a cause for the onset of heart failure in those with arteriosclerotic heart disease. Severe strains may also cause the onset of such symptoms but are less apt to in the rheumatic, syphilitic or thyroid types of heart disease. In these and also in the arteriosclerotic type acute infections, especially of the respiratory tract, are the most common causes for the onset of symptoms of heart failure. The toxins from these infectious diseases damage normal hearts sufficiently to give rise to the "effort syndrome"; they damage pathological hearts sufficiently to cause failure to function adequately even when the patient is at rest. Recovery from their effects is much slower when the heart is diseased. The onset of coronary thrombosis is often associated with such infections though it may arise at any time. Foci of infection in the respiratory tract, the alimentory canal or the genito-urinary system may also contribute to the onset of heart failure.

Arhythmias may arise following infections or in connection with changes in visceral function. Stimulation of afferent visceral nerves accompanying the vagus may, for example, reflexly stimulate the vagus inhibitory fibers to the sino-auricular node. As a result, the vagus effect may be removed and a sinus tacchycardia result; the sino-auricular node may be completely inhibited and one or another of the ectopic arhythmias may become established. Nicotine and other drugs may cause the onset of arhythmias in a diseased heart.

Mental strain, physical strain and hard work, mental or physical rarely, except as mentioned before, cause the onset of heart failure. They certainly do not cause heart disease.

IN THESE articles, an attempt has been made to emphasize those aspects of cardiovascular disease that are of particular interest to the physician in industry. Suggestions have been made as to contributions to our knowledge that those engaged in industrial medicine might make.

It seems that the etiological diagnosis is of much more importance in industry than is the anatomical, physiological or even the functional though these cannot be neglected. Next to the etiological diagnosis, the functional seems of greatest value; it is, of course, dependent to a large extent on the three other items that are required for a complete diagnosis. The criteria for the diagnosis of cardiovascular disease have not been considered as this subject has been so ably covered in monographs and in the standard text books and systems of medicine. It is hoped that this series of articles will constitute a supplement to such works that will be of value to the physician engaged in industrial practice.

Workmen's Compensation

—A Complete Study of the Subject with Special Reference to its Medicolegal Aspects—

by

THURMAN H. LAUTENSCHLAGER,
M.D., LL.B.
Medicolegal Consultant
Dayton, Ohio

IX. The Diagnosis

DIAGNOSIS is the term applied to the determination of the causative factors and the physical condition of the patient which give rise to his disability. The physical condition may be caused by injury, or disease or both. We will confine our analysis to those cases only which are or become a part of workmen's compensation. Those of the first class are ordinarily not difficult to place. Those of the second class most often require care, observation and therapeusis, coupled with sound medical judgment to arrive at a conclusion as to the difficulty. Those of the third class furnish the vast amounts of material which confuse the minds of laymen, investigators, commissioners and physicians.

Cases the Result of Injury Only

THE CASES falling under injury alone are seldom of difficult diagnosis except where the lesions caused by the accident are hidden. But in these cases these lesions do not remain forever obscure. They develop in a comparatively short time from the onset and usually have a definite sequence. Here again we are presented with the importance of prompt attention by one experienced in accident work, and a close follow-up observation until the case has progressed to its physical limit of recovery and discharge from treatment.

When a workman presents himself with a toe, for example, the soft tissue reddened, swollen and painful, the nail lifted and bleeding, with probably the soft tissue separated so that it resembles the skin of an orange after it has been stepped on, obviously this tissue has been subjected to pressure from two sides. The toe has been crushed. The mere fact that it has been crushed does not of itself, indicate the full extent of involvement. The history is at once to be taken and is most successfully narrated by the individual who has sustained it. The questions are: "how did it happen," "what fell," "how heavy was it," "how far did it fall," "what was the nature of the substance," "was the pressure suddenly or slowly applied," "what type shoe was worn," "was the pressure quickly released, or was there an attempt to drag the member out from under the pressure, or was the weight rolled over the toe." The answers to these questions may often be gained from a simple explanation of how the accident happened, but in any event they form an important part of the physician's knowledge in determining how far the tissue has been damaged.

When seen shortly after the accident, there may or may not be bleeding, there may not even be time for swelling, and surely not sufficient time for discoloration. What swelling develops will depend on how much interference there is in the normal circulation, and whether or not there has been an opportunity for any drainage through an open wound — in other words, whether the blood has damned back or has been released. If there is no break in the skin, swelling will occur, the amount of swelling being due, of course, to the extent of damage to the circulation. The black and blue appearance is caused by the extravasation of blood into the tissues, and is so pronounced at times as to cause blistering.

There are three distinct types of tissue in the body: the hard tissue comprising the bony framework; the semi-soft, such as cartilage ligaments fascia and tendons; and the remaining soft tissue. These types of tissue react differently at the time of injury and in the healing process.

Returning, however, to our toe—because this example will include all of these tissues and the same general reaction will pertain to most parts of the body, especially where the three tissues are as closely associated as they are in this locality—we have here the central bony structure, a convenient joint with its ligaments, articular surfaces, the intervening tendons and sometimes sesamoid bones in close proximity.

The tendons may be injured by being severed or shredded, but they have a happy faculty of rolling out to the side of the danger zone, and are often less injured than would be expected from the appearance of the tissue. When there are open wounds, inspection of this tissue is not

difficult, but when there are no open wounds the extent of involvement of these semi-soft tissues is determined by the reaction that takes place.

Now consider the hard tissues or bone. Not every crush of the toe results in dissolution of the hard tissue, but very often it is involved. Tip fractures are not alarming or annoying. They heal with the other tissue. However, if there is comminution and an open wound, or compound fracture, the small fragments may, if they become separated, cause some delay in healing. X-ray examinations will seldom reveal anything of value in the way of suggestive treatment, but when there are reasonable indications to reveal knowledge of some defect that cannot be made out clinically, they should be made. Of course, there is a greater indication for x-ray in any location where the soft tissue overlying the bone is more extensive and associated with muscle. So often the layman is of the belief that the x-ray will reveal any tissue abnormality, but the shadow that is portrayed will reveal only bony abnormalities or foreign bodies which cause a shadow. It is also true that ligamentous tears are revealed, but these are details of x-ray plate interpretations.

The diagnoses of conditions due to injury are comparatively easy to an experienced observer, especially when a case similar to the one just described presents itself.

Differential Diagnosis

AS AN EXAMPLE of the necessity for differential diagnosis, assume that the crushed toe does not come under professional observation until sometime after injury. Suppose an injury has actually occurred and has been self attended; hot applications, poultices, liniments, grandma's salve, or our old friend iodine, have been used.

The clinical picture at this time is quite different from the one just described. It requires experience to determine just what effect these self-applied medicaments have had. It is true that there was an original injury, and it is also true that there has been additional damage. Such aggravation is uncalled for and prolongs the healing, causing additional expense.

What was once only a bump on the toe has now become a mixture of injury and insult, the insult being worse than the injury, but nevertheless both must now be treated.

Definition of Infection

IF INFECTION has developed, the case is, of course, complicated. Some authorities suggest that every open wound is infected. This is a misstatement. A wound may and usually does have inserted infectious material, such as soil or clothing, but the term "infected wound" means the display of reaction to the infectious material. A wound that remains clean is certainly not infected. Infection may reveal itself but locally, or it may involve the surrounding tissue, or it may attack the lymph channels and run to lymph glands, creating the typical picture of lymphangitis (red streaks) lymphadenitis (kernels) commonly known as blood poisoning.

It is generally conceded that infection developing in a wound due to injury, arising out of and in the course of employment, is a part of the original injury. This conclusion is based upon the theory that every wound is infected and that the infection must be a natural consequence of the injury. As a matter of fact, the vast majority of wounds properly cared for from the beginning, do not show infection. I had occasion to check up on a series of puncture wounds for the purpose of determining the advisability of injecting antitetanus serum as a routine. Puncture wounds, by reason of their usual small opening have a tendency to seal over at the surface and quickly enclose any foreign substance or infectious material, and would naturally be expected to display infection more frequently than any other type of injury. At the time, I reviewed the most recent 600 cases in our files. Very few had been infected, and in the great majority of the infected cases, professional attention had been delayed for from 24 hours to several days. When these cases are properly cared for from the beginning, and the necessary drainage supplied, they do not run into complicated infections. Once the infection has developed, quite a different picture from the original injury is found.

Incidentally, infections following injury cause a great deal of trouble to the patient, to the physician and to those engaged in the administration of workmen's compensation claims. The end result is that of the infection and not the original injury. So if it is insisted that the injury receive prompt and professional attention, the likelihood of infection is greatly lessened.

Injury or Occupational Disease

SPECIFIC infections, such as anthrax and others which are classed as occupational diseases, are not properly classified. They are as much an injury as any other and should be so considered. Recently in Ohio, tenosynovitis and

bursitis have been added to the list of occupational diseases. This is purely arbitrary and is not founded upon a knowledge of medicine. The theory is advanced that, when pressure is applied gradually over a period of time, because a definite time of injury cannot be set, it is, therefore, an occupational disease. As a matter of fact, the damage to the tissue is the result of injury—in other words, had the pressure been applied suddenly, which it often is, and the same pathology results, it must be reported as an occupational disease. The cases of synovitis involving the tendon sheath are as often the result of sudden strain or contusion as they are of prolonged irritation.

We must not lose sight of the fact, however, that there are other causes of bursitis and tenosynovitis. They may be a part of disease processes, such as a syphilitis or tuberculous condition, but these cases are distinctly diseases and not of traumatic origin. With the classification as it now stands, there is greater difficulty in differentiating, since the inference is cast that a tenosynovitis or a bursitis is an occupational disease. These cases are used here only for the purpose of illustration, but it is easy to see how quickly an unjust claim may be founded simply by reason of an arbitrary classification.

It is not so easy to confuse traumatic processes and disease processes when they are defined and separated. As was pointed out, there is, for the most part, a definite line of demarkation. The present atmosphere on the subject is befogged because of the tendency to erase this line, and there has been much discussion as to an accepted definition for trauma as applied to workmen's compensation cases. It is not as difficult as it seems.

Definition of Injury

TRAUMA means injury. Injury means damage. Damage means harm. Harm to the tissue in any part of the body produces changes for the purpose of healing. If the healing process is not successful, further damage takes place. Disease processes have a natural tendency to heal, the same as traumatic processes. The great difference is that in disease, the trouble arises within the tissue. In trauma, the trouble in the tissue is produced from without.

Types of Injury

TO EXPLAIN more in detail, the types of injury are contusions, lacerations, incised wounds, puncture wounds and combinations of these, such as a contusional laceration, a lacerated puncture wound, or a lacerated incised wound. There are also varying degrees of these, such as superficial, or deep and crushing, or mangling injuries. Injury then, is a change in normal or diseased tissue which is caused by the application of some external force. Disease is a change in normal tissue which is caused by some pathologic agent within it. Infection, therefore, is a disease not produced in a strict sense by the injury but concurrent with the injury. If infection is considered a part of the injury, every injury would result in infection.

Systemic Infection

WE MUST remember that infection may be carried throughout the tissue without an external injury, for example, the systemic infection that may follow a common cold: tonsillitis, sinus trouble, or the septicaemia or blood infection that comes from an existing local infection. Consider a case of tonsillitis. The infection travels to the tissue surrounding the tonsil and localizes as a peritonsillar abscess (quinzy). This abscess may creep into the blood stream and the infectious material may be laid down in any part of the body. No tissue is guaranteed exempt from attack. Acute ear involvement, mastoiditis, rheumatic arthritis or metastatic abscesses—these in turn may again throw infectious material into the blood stream, but nature attempts to set up its natural barriers to the advancement and builds up sufficient antibody, immunizing, reactionary forces to offset it and begin the process of recovery. This, in a general sense, is the way disease is offset and healed, if it is to be healed at all.

Injury and Disease

NOW picture a case where the individual is suffering from or has recently entertained a disease process. Many individuals remain at their employment when they are not feeling well. During this process an injury is sustained—assume a contusion to the finger. The skin remains unbroken, but there is produced a local damage to the tissue. In this locality the tissue loses its normal vitality and the organisms circulating in the blood, partially inactive by reason of the working of the general reserve forces of the body, find this existing abused site. They become active in this tissue and the evidences of infection assert themselves. This is the result of a hematogenic transfer to this point, called the *locus minoris resistentiæ*, or the site of least

resistance. Obviously the infection has complicated the injury, for, without the infection existing at the time in the body, local infection would not have resulted.

It must be remembered that it is important to differentiate between a process that is founded on infection and what is known as a sterile abscess. A sterile abscess is one where the vitality of the tissue has been destroyed and a necrotic area develops. Nature, in an attempt to throw off the necrotic material, must find a means for drainage, and in so doing sets up sufficient reaction eventually to break the skin and allow the dead tissue to exude. This abscess is truly the result of injury, and it is not an infection.

The so-called cold abscesses are usually considered a part of a tuberculosis process, and are ordinarily distinctive in their onset and progress.

It is, therefore, important that the greatest care be taken in analyzing injuries from every angle; and it is also important that the industrial physician and surgeon be well grounded in his general medicine. The failure of proper diagnosis prohibits an intelligent and complete report to industrial commissions and boards of award, resulting in an enormous charge upon industry. The fact that the administrative bodies cannot be too careful in making awards is also indicated. The same is true of judges in making their charge to a jury, although they are limited to the evidence and the manner in which the case has been presented to them.

X-Ray Examinations

THE RESORT to x-ray examinations is often indispensable. It is also overdone in cases which have been submitted to the examination of commission examiners. These statements are best explained by following a case through.

In the first instance, a patient subjected to violent external force or the extreme overaction of muscles, especially those cases where the force has been applied to areas without much soft tissue padding, should be x-rayed if there is any indication that the diagnosis is uncertain as to bone involvement — as to hands, feet, wrists, ankles, elbows, knees, head or spine. Usually the clinical signs of fracture are evident. When they are clinically evidenced, it is not necessary to make an x-ray examination immediately. Having knowledge that a fracture is present, proper procedure is indicated. The fracture should be reduced and the necessary fixation dressing applied. After this is done a plate may be made for the purpose of verifying position. Thus when the plate shows good position, the work is already done and the patient sent on his way. Contrast this procedure with the common practice. In the vast majority of cases the patient is examined and fracture very much suspected. Without proceeding to a reduction, the patient is submitted for x-ray examination, and even under the best possible facilities, this is a needless delay. The x-ray having been made, very little additional knowledge is gained. In a sense, the x-ray has simply said, "Well, you are right, there is a fracture." Now the reduction is made and the part immobilized. Then comes another plate to see what the position is after reduction. If the apposition is not satisfactory to the operator, he makes another attempt and then another x-ray. In severe types of fractures, especially those which are "hard to hold," a series of plates at intervals of progress are not only to be desired but also are really mandatory. This serves a two-fold purpose: the display of progress and a permanent record of it. This is not only important from a medical point of view but also from a legal point of view. As to commission examiners it means comparatively little, for they usually run through another series of plates to show again what they have already seen. It is quite surprising to note how frequently this is done, and this sentence would be incomplete if mention were not made of this great additional expense. But of course this only occurs in those cases where additional compensation is claimed or continues over a period longer than the original estimated time, or where the patient has been discharged as having attained the limit of recovery. Cases of our own experience of this kind are few in comparison, and almost without exception are those in which the claimant is adding to his already existing or non-existing disability.

Without doubt, the x-ray is one of the most valuable of equipments in the armamentarium of the industrial physician and surgeon, but it is only an adjunct. It is only a part of laboratory procedure, and in no instance does it reduce a fracture or dislocation. Granting its great importance, it may be somewhat misleading. X-ray distortion must not be forgotten. For this reason a poor x-ray may be worse than nothing, and the performance of these examinations in the hands of a thoroughly trained and experienced roentgenologist is, of course, the most valuable information. Not only this, but x-ray interpretation also is just as essential as the plate. A layman may think he sees things in an x-ray

plate that mean absolutely nothing, and on the other hand evidences are present to the experienced observer that would likely be missed entirely by the casual observer. X-ray technique, like surgical technique, is a something that the operator develops. The distance, the timing, strength of ray, area to be rayed, position, character of tissue, are all of the greatest importance if the x-ray is to show what it is intended to reveal.

Special Examinations

THE FIELD of special examinations arises most frequently in those cases involving a question. By that is meant the relation of the condition of which the claimant complains at the time the examination is required, to that of the original injury; for obviously if it has no relation to the original injury, it is not compensable, or better, should not be compensable under the fundamental principles of workmen's compensation. But "right here is the rub." For example, take a case of a head contusion with a minor laceration. I know of no single condition, unless it be a back injury, that is supposed to give rise to so many and so complicated a series of symptoms. The cases representing claims adjusted by the commissions and the courts would have you believe that there is nothing in the medical field to be excluded, for they include anything from intermittent dizziness to the most complicated and rare nervous diseases, such as multiple sclerosis, insanity and even blindness. It would, of course, be a misstatement to say that certain types of injury could not produce permanent defects because this is too well known, and, as before mentioned, when the injury is the direct cause, the symptoms are most often those easily traced in sequence. When they are not easily traced, the safe inference always is that the injury was not responsible. We have had occasion to observe many such cases which were not, by any means, just claims but for some reason or other have been allowed or verdicts rendered.

The reasons for these decisions and awards have been due to smooth procedure and presentation of cases by attorneys, coupled with insufficient knowledge on the part of the defense, the shameful and unscrupulous evidence of plaintiff's medical testimony, and misunderstandings on the part of members of commissions and boards of award. Most of these unjust claims could be defeated by consulting with a medicolegal expert. Unfortunately few who are qualified in this subject are available, but this does not alter the fact that one of these experts should be present or consulted in all cases involving medicolegal questions. Clear cut cases are always without question, and legal recourse of hearings and rehearings is not required.

Blood Examinations

PROBABLY the most complicating causative factors of retarded recovery are reflected in the blood. Without a doubt, healthy blood will promote prompt repair of any damaged tissue whether it be damaged by diseases or injury. Syphilis, of course, stands very conspicuously. Tuberculosis, pernicious anemia, the secondary anemias, loss of endocrine balance are factors. However, reasoning from knowledge surely will not justify a conclusion that a bump on the shin will produce syphilis or tuberculosis. These processes must be present in the system before they present themselves as involving a site which has been subjected to violence. The common syphilitic leg ulcer is a good example. Suppose an individual, entertaining a syphilitic infection, receives a bump on the shin. The syphilis may or may not retard healing. But if it does retard healing the syphilis is the cause of the delay and prolongation of the disability. Industry certainly is not the cause of the syphilis. Industry, therefore, should be charged only with the damage for which it is responsible. The same is generally true of any condition present within the injured at the time injury was sustained. These claims are allowed on the theory that the accident lighted up the process. This is really "putting the cart before the horse." So often the statement is made that the individual, prior to the accident, was in perfect health. When accidental damage to tissue occurs in a perfectly healthy person, repair is sure to follow. It does, as a matter of fact, follow in the vast majority of cases when the general health is not absolutely perfect.

What will the special examination disclose? Blood tests, metabolism tests, urinalysis, etc., will show underlying pathology, but it is surely unfair to industry to be charged with complete physical examinations because a certain injury has been sustained. Even the rupture of an organ, such as the lung, liver, spleen, intestine, or the like, if it is not repaired by a healthy background, will result in death. It may require a long period of convalescence, or death may come after a protracted period, but in any event the sequence is definite and the chronological medical history leaves no doubts. When special ex-

aminations disclose the presence of influences extraneous to the injury, the effect of the injury as to healing time should be separated from the extraneous influences. This is attempted, it is true, but the best and most reliable information is obtained from the attending industrial physician and surgeon. Here the attention is given from the beginning, with personal observance of the daily progress and a record of that progress kept. Special examinations are, therefore, less often required.

When a case has traveled from one medical hand to another, with voluminous reports and varied opinions, there is always a greater complication of the condition, and instead of getting closer to a diagnosis, the number of bypaths go far astray.

Osteopaths, Chiropractors, Cult Healing, etc.

THE STATE of Ohio recognizes chiropractors, osteopaths, mechano-therapists, masseurs, as branches of medicine and conducts examinations in these branches. It is not my purpose to discuss the differences as to virtues or vices in this connection. What we are principally concerned with here is diagnosis. The question as to the ability to make a diagnosis, of course, depends upon training and experience. If the diagnosis is to rest upon the findings and sound judgment, it is hardly necessary to state that there must be ability to find, and a judgment consistent with those findings.

Since it is true that representatives of these branches are seldom found as industrial physicians and surgeons, the suggestion arises that naturally there would be a limited experience in this class of work, for as already stated, industrial-mindedness is most important.

Importance of Diagnosis

SO WE FIND that the diagnosis of a condition is the prime requisite to proper care. If an injured employee suffered from a headache because he was entertaining an infected puncture wound, treatment for his headache alone would be of little value, for it would not be getting at the causative factor.

The narration of a rather unusual case by way of illustration as to diagnosis in industrial work may be of interest. The patient presented himself with a deep laceration at the base of the thumb on the dorsal aspect. The extensor tendons were severed. The accident occurred while cranking an automobile. The crank slipped and the hand came through, striking the lower edge of the license plate. The wound was ragged and dirty, both with grease and mud. The injury, was cleansed, the tendons sutured, and the wound closed, leaving drainage. Our practice is to use a prophylactic injection of antitetanus serum in wounds most likely to be contaminated by tetanus, and where there are possibilities of remaining dead spaces in the tissue even after repair, but we do not use the injection as a routine in every injury.

This case carried definite indications for the serum and it was accordingly administered, with an explanation of its purpose to the patient. Progress for three days was uneventful and the injury was healing beautifully. During the night of the fourth day we were called by the landlady of the place where the patient was rooming and informed that the patient was suffering severe pains, headache and cramping of muscles, especially those of the jaw and that he could not open his mouth.

Without delay, the ambulance was ordered to convey him to the hospital and we proceeded there in anticipation of his arrival. Within 30 minutes of the time we received the call, the patient was in a hospital bed. A thorough examination was made, and we found him able to talk but in a state of extreme excitement. He complained of tenderness in parts of his body, but the tenderness did not remain at the same places. He concentrated particularly, upon the tenderness of the muscles of mastication. We did not hesitate to say he was certain that tetanus had set in. With the history as we knew it, there was, of course, the possibility. Yet there were two things not to be forgotten. There could be a reaction from the prophylactic injection which, however, would be a little late in presenting itself, or the patient, by reason of fear, might have developed a mental reaction. He was given sedative treatment, and the wound was redressed and carefully observed. The next 24 hours worked a complete change. Tetanus did not develop, and he admitted that he had worked himself into a frenzy by reason of fear. Had another physician been called to see him at the time he was sent to the hospital, he would have been justified in instituting tetanus treatment, which, of course, would have been primarily the administration of large doses of antitoxin. But as we had a full knowledge of the case from its onset, we were in a position fully to appraise the case, and save him the discomfort and danger of injections and also the cost of the treatment.

This case also serves to illustrate the fact that

had curative doses of antitoxin been injected and recovery had it would have been credited on the hospital records as a case of tetanus cured by antitoxin.

The Practical Value of Physiology to Industry

By G. P. CROWDEN*
Lecturer in Industrial Physiology, London School of Hygiene and Tropical Medicine

A DUAL FIELD lies before the application of physiological science in industry—namely, to the worker in relation to his or her work, and to the products of manufacture in respect of their value for meeting specific physiological needs of man.

First of all let us consider the general problem of the worker at his work. It is clear that the various physiological factors which must be considered individually and collectively in any single problem of work in a factory, workshop, or mine fall into four distinct though mutually reacting groups, each and all of which affect the daily cycle of work, fatigue and recovery, the equilibrium of which from day to day is all-important.[1] The four factors to which I refer are the work factor, the environment factor, the time factor, and the personal factor.

The *work factor* comprises the study of the muscular effort involved—whether heavy, moderately heavy or light—and the exertion of that effort with minimum fatigue and optimum efficiency.

The *environment factor* involves consideration of the reactions of the human body when subjected to the varied environmental conditions associated with particular types of industrial work; for example, it is necessary to know the limits of temperature and humidity which, if exceeded, impose too great a strain on the natural powers of the body to maintain normal body temperature and optimum functioning of nerves and muscles. Then, again, the environment in respect to lighting, noise and vibration involves detailed and careful study if the worker is to be given a physiological opportunity of making the best use of his powers.

The *time factor* not only offers problems concerning the optimum duration of work-shifts in relation to the severity of the work and the strain of the working environment, but the rate of execution of the work may produce unnecessary fatigue unless it is adjusted to the physiological powers of the worker.

Lastly, we have the *personal factor,* which differs from the other three in that it is essentially under the control of the individual worker, though the others are almost entirely under the control of the management. It depends on the individual whether he will avail himself or herself of facilities and advice given. For example, it rests with the worker whether he makes proper use of protective clothing or respirators, or adopts methods of working and resting recommended as a result of investigation and experience, or whether the family food is bought to the best advantage and provides the necessary amount of energy and constituents essential for health.[2,3] Only education, understanding, and, above all, goodwill between employees and employers can ensure that this factor does not discount the good which might be done by proper attention to the other three. Naturally the personal factor falls largely into the domain of psychology as applied to industry, and the proper selection of operatives according to their aptitudes and physical fitness is, of course, essential for the best results.

Before referring to certain specific researches dealing with these factors, I wish again to point out that, although each study may in itself be confined to one factor only, yet, in practice, all the factors affecting the efficiency or equilibrium of the cycle, work, fatigue and recovery, have to be duly taken into account. It would be of little benefit to a worker if he were carefully instructed to perform a manual task in such a way as to increase his efficiency of performance and economy of effort if the conditions of temperature and humidity of the working environment were such that, however efficient his performance might be, the strain imposed on his body by the environmental conditions was excessive.

Muscular Work

MUSCULAR work can be carried out owing to the energy liberated when materials derived from foodstuffs undergo chemical change and combustion in the muscular tissues of the body. Even at his best, man is only approximately 25% efficient in the mechanical sense,

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* *The Human Factor,* London, February, 1934. Part of a paper read before the Department of Industrial Cooperation at the British Association Meeting in Leicester, September, 1933.

1. Crowden, G. P.: *Muscular Work, Fatigue and Recovery.* (London: Pitman, 1932.)

2. Crowden, G. P.: "The Minimum Cost of Physiologically Adequate Diets for Working-Class Families," *The Lancet,* April 23, 1932, p. 899.

3. "Food and Health," *The Lancet,* March 18, 1933, p. 597.

which means that for every unit of useful work performed at least three times as much energy is wasted as heat. This heat must be transferred from the body to its environment if the body temperature is to be kept within normal limits. It is only too easy for work to be performed at a much smaller efficiency than 25% by executing unnecessary effort or movements or working under conditions of postural strain, or even executing the necessary movements too rapidly or too slowly.

In muscular work the additional oxygen absorbed in respiration by the worker is directly proportional to the energy expended by his body in the performance of the given muscular task. Hence by measurement of the amount of oxygen used during rest, and during work and the recovery from work, it is possible to find out the increased oxygen usage occasioned by the work, and to express in terms of cubic centimetres or litres of oxygen the relative cost to the worker's body of executing the given task in varying ways and at different rates. By such physiological experiments on man it is possible to determine the mode of execution of the work which permits the minimum expenditure of bodily energy by the worker. In heavy muscular work and also in continuous moderately heavy work this is desirable, but in light tasks the actual amount of energy expended matters little; in fact, if more muscular effort and movement were involved in some occupations, the workers would in all probability benefit very considerably.

Energy in Load Carrying

IN THE United Kingdom various problems of muscular work in industry have been investigated for the Industrial Health Research Board, formerly known as the Industrial Fatigue Research Board. For example, the moderately heavy continuous muscular work of carrying loads by women was investigated by Professor Cathcart and Miss Bedale and others at Glasgow.[4,5] By measuring the oxygen used per minute when a given load was carried in varying ways it was shown that when the load was handled or distributed so that the normal erect posture was least disturbed, the oxygen cost per unit of useful work done was at a minimum. Further investigations showed that the maximum loads carried should not exceed 40% of the body weight of the worker for continuous work, nor be greater than 50% for intermittent carrying. For average women workers this would mean that the loads carried should not exceed 45 lbs. for continuous work or 55 lbs. for intermittent effort. Moreover, if the load is difficult to handle, the weight should not exceed 40 lbs. The importance of avoiding postural strain and the means for avoiding it are still not fully realized. The unnecessary fatigue occasioned by postural strain, particularly in light continuous work, may materially affect the health and working capacity of workers.

Energy in Barrow Work

IN THE case of heavy muscular work by man an investigation was carried out on barrow work in the Fletton Brick Industry.[6] Electric barrows and other mechanical devices are to a large extent replacing the hand barrow, but there are many industries in which the latter are still employed. The oxygen used by the worker when pushing a loaded barrow was measured, and these experiments clearly demonstrated that the stopping of the barrow owing to a badly arranged run between the kilns and the presses or rail sidings might involve the expenditure of 30% more energy per load by the worker. In such work the worker is getting quite enough physical exercise, and any wasteful expenditure of energy per load may amount to a great deal at the end of the working day, during which he may have handled 140 barrow loads of bricks.

It was also shown in this investigation that the normal brisk walking pace of the worker was more economical than either a deliberately slow walk or a forced walking pace such as is often adopted by men on piecework when emptying the kilns of burnt bricks. Further, ways of loading the bricks on the barrow in accordance with the stature of the individual were studied, and a working routine was devised whereby new workers could be easily shown the optimum arrangement of the load to suit the natural height of their hands above the ground level.

Energy in Various Industrial Tasks

IN GERMANY, at the Kaiser Wilhelm Institute for the Physiology of Labour at Dortmund, detailed studies[7] have been carried out on

4. Bedale, E. M.: "The Effects of Posture and Rest in Muscular Work," *Industr. Fat. Res. Bd. Report,* No. 29, 1924.

5. Cathcart, E. P., and others: "The Physique of Women in Industry," *Industr. Fat. Res. Bd. Report,* No. 44, 1927.

6. Crowden, G. P.: "The Physiological Cost of the Muscular Movements involved in Barrow Work," *Industr. Fat. Res. Bd. Report,* No. 50, 1928.

7. Atzler, E.: "Industrial Physiology," *Internat. Lab. Office Occupation and Health Brochure,* No. 211, 1930.

miners pushing trucks, on men turning crank wheels of varying diameter and at various heights above the ground, and on the lifting of loads. In all these cases, by studying the oxygen consumption for the work the optimum conditions for its performance have been determined.

In light speed work, such as in the boot-making industry, the actual expenditure of energy by women workers may be slight: but this does not necessarily mean that the fatigue produced will be proportionately small, for the work may entail the continuous use of the fine muscles of the hands and fingers, and may necessitate continued postural strain unless the height of the work bench or seating is properly adjusted to suit each individual worker. Static effort or continued muscular strain is particularly fatiguing, and I believe that in Russia at the present time physical exercises are occasionally introduced during work periods in order to compensate for the harmful effects of prolonged postural strain which certain types of industrial work of necessity involve. In this country and America physical recreation and training are encouraged by many industrial concerns, and this is undoubtedly of the greatest possible value to employees whose work is manual but sedentary.

Before leaving the subject of muscular work I would mention that muscular exercise or muscular work is essential for health, and if it is done without excessive strain and in a good working environment it is the form of work to be most desired. The fatigue which follows work in the fields is normal fatigue and the rest that follows it is restful—the same cannot be said of the fatigue which follows excessive postural strain or work in an artificially created working environment, where noise, vibration and extremes of temperature and humidity place an added strain on the worker.

Noise and Vibration

IN MANY types of work the introduction of mechanical devices and tools operated by compressed air has profoundly changed the character of the worker's effort, though the product of his labour is the same as before. In the case of the road-breaking pneumatic hammer or the riveting hammer, the worker's muscular effort is exerted against the mechanical tool in order to guide it and keep it in position to do its work. His actual oxygen consumption and expenditure of energy may be much less per unit of useful work done than if he used a sledge hammer—with the use of which he did at least have the stimulus of dynamic effort and the increased circulation of blood and variety of movement entailed thereby. Postural strain and static gripping effort with pneumatic tools are increasingly replacing the former dynamic muscular work. On behalf of the Industrial Health Research Board I have been conducting an investigation on the effects of vibration on the worker and also of the noise inseparably associated with such work.[8] This research has already shown, both by laboratory experiments and in observations in boot factories and on riveters at work in H. M. Dockyard at Devonport, that under certain conditions of external cold the hands of workers tend to become unduly chilled when using vibrating tools, and that this condition can be avoided by local warming. It appears that if the hands are cold the blood supply to the fingers is more likely to be affected by vibration than if they are kept warm; and no doubt the 'cushion' effect of a good blood flow through the fingers and hands damps down the vibrations and protects the delicate tissues from injury by repeated mechanical shocks. The laboratory experiments in an investigation such as this are carried out in a special laboratory or air-conditioning room, in which it is possible to vary and control conditions of temperature and humidity and air movement so as faithfully to reproduce actual working conditions met with in workshops or mines or in the open. Then the laboratory finding must themselves be confirmed by field observations before any sound practical deductions or recommendations can be made. The point I wish to make is that industrial physiology is not confined to the laboratory, but that field work guided by laboratory experience is most valuable: and I welcome this opportunity of indicating the need for closer cooperation between physiologists and those who are up against physiological problems in industry. Until general physiological principles are understood, it is not likely that the difficulties encountered in many types of industrial work will be recognized as problems for the industrial physiologist to solve in cooperation with the engineer.

The Protection of Hearing

I CANNOT leave the subject of vibration without referring to the effect of noise on hearing, or what is commonly described as "boiler-maker's deafness." The acuity of hearing of a number of riveters and non-riveters in H. M.

8. "Noise and Vibration," *Industr. Health Res. Bd. Thirteenth Ann. Rep.* 1933, p. 9.

Dockyard at Devonport was measured, and it was evident that riveters and 'holders-up,' after 15 years or so on the job, showed distinct deafness in both ears, of a degree which would amount to a serious handicap in a school child. I think this condition is preventable if the workers will use, and are given the opportunity of using, a very simple ear-stop of cotton wool and paraffin wax. That these stops were effective and easily used was proved by tests at Devonport on ourselves and on the riveters, and by the fact that the workers themselves rapidly exhausted our stock of several dozen pairs. Recently I have had the opportunity of confirming the tests in the boiler shops at the railway works at Stratford. Inside a boiler or between decks on a ship under construction, the rhythmic explosive pressure-changes due to the pneumatic tools make one feel as if a giant has boxed one's ears, and the ear-stops undoubtedly deaden the shock very materially.

Noise, vibration, lighting, the temperature, humidity and movement of the air, and radiant heat from the surroundings are environmental factors of physiological significance which are of no little importance both in industry and in everyday life.

Lighting

IN REGARD to lighting many investigations have been carried out by the Industrial Health Research Board and by the Department of Scientific and Industrial Research. In the Home Office Industrial Museum in London the main results of recent investigations and their significance to industry are demonstrated by full-scale lighting installations and models. A particularly interesting piece of work was carried out on the relation between illumination and the number of errors made in type-setting by hand.[9] In this experiment it was shown by tests on skilled compositors that only when the intensity of artificial illumination approached 24-ft. candles did the efficiency of type-setting, as judged by the number of errors, turned letters and total output, approximate to the efficiency in good daylight lighting. If the illumination was only two foot-candles, one quarter of the possible output was lost, the mistakes more than doubled, and the fatigue experienced by the compositor materially increased. Another investigation which indicated the importance of paying due regard to the physiological limits of vision was that of Weston and Adams,[10] in which the fine work of linkers in the hosiery industry was carefully studied. Those workers showed that eyestrain was produced by the effort of converging and focusing both eyes on fine silk threads which had of necessity to be held close up to the eyes for them to be seen at all. Suitable spectacles were tried on workers with normal sight, and it was found that not only was there a material reduction in fatigue, but a considerable increase in the rate of working—results beneficial both to the workers and to the industry.

Ventilation and Heating

THE TEMPERATURE, humidity and movement of the air, or, speaking generally, the conditions of ventilation in a factory or mine are well known to exert a profound influence on the health and working capacity of the workers, particularly if the work is heavy and the physiological cooling power of the air is low. In heavy muscular work a man may generate waste heat at the rate of 30 or 40 British thermal units per minute, and this heat will cause his body temperature to rise to dangerous heights if he cannot get rid of it to his working environment. The temperature of his surroundings, the temperature and movement of the air and its humidity, together determine whether he can lose this heat. In hot and deep mines the problem of maintaining a physiologically safe working environment is a very difficult one. Recently I had a visit from a doctor from one of the Rand gold mines who had studied the reactions of native miners to work at the high temperatures and humidities, *e.g.* 90° F. dry bulb and 89° F. wet bulb, such as are met with at depths of 8000 ft. where wet drilling is employed. He had devised routine physiological tests by which he was able to pick out those men who showed abnormal reactions to work under such conditions, and who might develop heat stroke if sent to work in the mines without a preliminary period of less severe work.

Tests of this kind are in the interests not only of the workers but of the industry, for by suitably adjusting the acclimatization period for the susceptible men it appears to be possible to minimize the risk of heat stroke and heat collapse. However, physiological tests alone are not

9. Weston, H. C., and Taylor, A. K.: "The Relation between Illumination and Efficiency in Fine Work," *Industr. Fat. Res. Bd. and Illum. Res. Cttee. Joint Report,* 1926.

10. Weston, H. C., and Adams, S.: "The Effect of Eyestrain on the Output of Linkers in the Hosiery Industry," *Industr. Fat. Res. Bd. Report,* No. 40, 1927.

enough in such extreme cases as this. If the mines are to go deeper, engineers and medical scientists must collaborate, the latter defining the physiologically permissible limits of temperature, humidity and air movement, and the former devising ways and means of insuring the maintenance of such conditions in the working environment. I am quite convinced that an immense amount of benefit to workers and to industry will result from mutual cooperation between engineers and medical scientists, and that without such cooperation practical achievement will be either delayed till bitter experience teaches us what to do, or rendered impossible by the physiological and psychological make-up of men. Such cooperation as I visualize can only come if it is realized that the human factor is all-important, and that at least an elementary knowledge of physiology and its applications in industry should be possessed by all those who are destined to have the control and management of men and women workers in our factories, offices and mines.

Products of Industry

NOW IN REGARD to the second field of application of physiology in industry—namely, in respect of the products manufactured.

Some time ago I had the opportunity of testing the effectiveness of a new system of heating in a certain school.[11] The tests carried out did not depend on measurements of air temperature or on estimates of the number of BTU's of heat liberated in the room, but consisted of physiological observations of the temperatures of the fingers and hands and foreheads of the children in the classrooms in the course of their ordinary school work. It was apparent at once that although a great deal of heat was being put into the rooms, adequate warmth was not being imparted to the children—or, more correctly, I should say that their heat loss to their environment was excessive. On the same day in another classroom with a different system of heating the children were comfortably warm and able to do their work efficiently.

I simply mention this case in order to indicate the need for the closest possible liaison between the science of heating and ventilating engineering and physiological science, particularly when some new system of controlling the external environment is to be offered to the public.

In regard to clothing, the physical tests designed to determine its utilitarian value as an aid to body-temperature regulation and comfort should bear some direct relation to known physiological data. In other words, the heat-insulating value of clothing should be determined at temperatures and under conditions closely corresponding to those which persist when the material is actually worn on the body. More work, however, needs to be done on this subject.

Heat Insulation

DURING the past year I have been carrying out an investigation on the protection against heat from the sun afforded by army service topees or sun-helmets. It had been suggested that painting the inside of tropical helmets with aluminum paint would make them cooler to wear owing to the well-known value of such metallic paint for conserving heat. Physiological tests in which the temperatures developing in close proximity to the scalp were measured showed little effect due to the paint, but the inquiry led to other materials being tried; and it was soon found that lining the helmet with tin or aluminum foil made a marked difference in the amount of heat radiated to the head from the inside of the helmets. This is readily understandable, for it has long been known that a bright metallic surface is a poor emitter of radiant heat. The laboratory tests were carried out in the air-conditioning room at the London School of Hygiene and Tropical Medicine, in which tropical temperatures could be reproduced while the long-suffering experimental subjects sat wearing the helmets underneath electric radiators. The temperatures developing above their heads were measured electrically, and it was found that with the metallic lining the temperature was 10° F. or more lower than when the ordinary fabric-lined topee was worn.

Scotland Yard kindly lent me two police helmets, and a test in the June sun last year yielded similar results—the temperature rising to nearly 120° F. in the ordinary helmet with a green pegamoid lining, while it remained below 105° F. in the helmet when the metallic lining was worn. The sun was not strong enough in London for experiments on tropical helmets, but, thanks to the army authorities, I was able to carry out field tests on troops in Egypt during August last year. Both when sitting in the sun

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11. Crowden, G. P., and Hetherington, M., assisted by Luxton, W. R.: "A Comparative Study of the Physiological Effects on Children of School Heating by Hot-Water Radiators and by Radiant Heat from Electric Ceiling and Wall Panels," *Journ. of Hygiene,* vol. xxxiii, no. 2, April 1933, and *The Heating and Ventilating Engineer,* vol. vi, nos. 69 and 70, March and April 1933.

or marching over the desert, the temperatures above the heads of the soldiers were materially lower when the metallic linings were worn, and sweat disappeared from their faces, only to reappear again when the linings were removed. These field tests in Egypt also showed that if the ventilation in a sun-helmet is hindered, the temperature above the head may rise to 8° F. or 10° F. higher than it would do with free ventilation past the head-band and through the top ventilator. Even a degree or two extra when the temperature is already above that of the body makes all the difference between comfort and discomfort, quite apart from the question of heat stroke or heat collapse; and such tests, or shall we say physiological experiments, on human beings indicate in what ways such manufactured products as tropical helmets can be materially improved.

From the physiological point of view it is the surface radiation temperature of the inside lining of a tropical helmet, or tent, or even of the walls of a room or hutment in the tropics which matters; and provided this is kept within limits compatible with human comfort, in spite of external heat or cold, then the insulation is efficient. Further work on this subject is necessary before it will be possible to express the efficiency of various forms of insulation in terms indicating their relative value for purposes of increasing human comfort, apart from their value as conservers of heat in terms of BTU's per degree Fahrenheit per square foot of surface per inch thickness per hour.

A great deal remains to be done, and I am sure can be done, in the way of improving conditions of habitation in the tropics and elsewhere by the use of insulation in buildings, and such improvements will inevitably be associated with increased health and efficiency. I should mention, however, that developments and progress in this direction will only occur if the cost of such improvements is within the compass of those who need them.

In this paper I have attempted to survey the field and indicate some of the links which physiological science has with problems concerning the worker at his work, and the utilitarian value of the products of industry for improving the comfort, health and efficiency of mankind.

Cooperation between medical scientists and industrial scientists, engineers and others cannot but be productive of results beneficial to the community as a whole. What physiological science can teach and prescribe in respect to the needs of man, industrial science can seek to study with a view to supplying those needs most effectively. The respective role of each is clear, but each should be recognized as a friend of the other, and both should be working together for the common good.

Thallium Poisoning

LUDWIG AND GANNER describe three cases of acute thallium poisoning. The patients at first did not admit having ingested thallium, and the disturbances were not correctly diagnosed until the characteristic loss of hair set in. The initial symptoms are paresthesia and severe pain in the extremities, particularly the legs. Intestinal disturbances of a colic-like character may develop within the first 48 hours, but as a rule they do not become manifest until several days later. Renal disturbances in the form of albuminuria and cylindruria occur generally during the first week. The cardiac disorders that present themselves within the first two weeks are tachycardia, weak pulse and, occasionally, stenocardial symptoms. Acute dilatation and collapse may threaten. Insomnia appears early and is much complained of. It may be partly caused by the severe pains, but as a rule it persists after the pains have disappeared, and consequently the intoxication as such must play a part. Disturbances of the bladder in the form of inhibition of micturition or of incontinence exist for a number of weeks, and the incontinence of the bladder may be accompanied by that of the bowel. The pathognomonic loss of hair generally sets in during the third week following the ingestion of the poison. The authors also noted changes in the nails (white streaks) and, in one case, cutaneous changes in the nail bed. They think that the initial paresthesias and pain in the extremities were a manifestation of polyneuritis, which in two cases later developed into a degenerative-atrophic paralysis. Involvement of some of the cerebral nerves (facial and recurrent) although rare in thallium poisoning, has been observed in two cases. The functional disturbances of the bladder were probably caused by an impairment of spinal nerves. Whether the temporary ataxia, which in one patient involved all the extremities and the trunk, was of central or neuritic origin could not be determined. Metabolic tests revealed abolishment or reduction of the specific dynamic protein action.—*Deutsches Archiv fur klinische Medizin* (December, 1933).

The Medical Department Manual

—The Complete Handbook of Organization, Operation and Routines Representing Actual Experience and Practice of 20 Years—

by

HART E. FISHER, M.D., F.A.C.S.
Chief Surgeon
Chicago Rapid Transit Company

II—Physical Property

WHEN the Medical Department was first established by the Chicago Rapid Transit Company in 1913, it consisted of one room located adjacent to the superintendent's office on Marshfield Avenue, and because of its proximity to the Loop it could be reached by employees of the other Elevated Lines with the least amount of inconvenience and time. As the installation of the Medical Department was an innovation, in fact an experiment, it was thought best to organize and build up the department slowly, adding to it as the needs arose, and then if the experiment failed, it would not be as noticeable as it would if the outlay and expenses were great. This is one fact that should be taken into consideration by all those anticipating the establishment of a medical department. Lack of conservatism as to outlay and expense at the start has spelled disaster to a number of industrial medical departments. Take your employees into your confidence when you are about to install a medical department and explain its purpose and your hopes for its success. This is the key to the growth of the Medical Department of the Elevated railroads.

As the medical policy of the company was put into actual operation and each new phase inaugurated, it was soon evident that there was need of larger quarters, more centrally located, if it was to operate with the highest degree of efficiency. It was essential that the Medical Department be in close contact with the other departments in the industry, and, as they were located in the Edison Building in the Loop of Chicago, this department was moved to that building. Here a suite of three rooms served for the short period of three months, and as the activities increased so rapidly and the patronage of the employees reached such large proportions, it was necessary to move to more spacious quarters of six rooms. This space was sufficient to meet the needs of the department until after the war and the return of the Chief Surgeon from the army, when it was moved again into an office of eight rooms. There seemed to be no limit to the expansion of this department. As each new company with its host of employees came under the service of the Medical Department, it was necessary further to enlarge the floor space. In 1925, having outgrown the available space in the Edison Building, it was seen fit to move the department into the Chicago Trust Building at 79 West Monroe street, which joined the Edison Building by a covered passage-way. The new suite consisted of 10 rooms and is known today as the south wing of the Medical Department. Owing to the increase in the number of companies seeking the services of this department, and subsequently the number of cases, an entire rearrangement of the 13th floor was necessary in order to permit of the expansion of the department in 1928.

This history is given

Sec.	I.	History of the Medical Department (*Jan.*)
Sec.	II.	*Current Issue*
Sec.	III.	*Current Issue*
Sec.	IV.	Functions and Routines
Sec.	V.	The Centralized Medical Department
Sec.	VI.	Relations with Other Departments
Sec.	VII.	Relations with Municipal, State and Federal Agencies
Sec.	VIII.	Medical Department Forms
Sec.	IX.	First Aid in Industry
Sec.	X.	How the Medical Department can be a Factor in Reducing Absenteeism
Sec.	XI.	Sanitation in Industry
Sec.	XII.	The Nurse in Industry
Sec.	XIII.	Research in Industrial Medicine and Surgery
Sec.	XIV.	Industrial Medicine and Surgery; its Past and Present Status
Sec.	XV.	Requirements of a Course of Industrial Medicine and Surgery
Sec.	XVI.	Classification of Physical Defects
Sec.	XVII.	General Instructions to Examining Surgeons
Sec.	XVIII.	Classification of Physical Defects for the Reviewing Surgeon
Sec.	XIX.	Regulations and Requirements Governing Physical Examinations
Sec.	XX.	Interpretation of Physical Defects of Employees for Department Executives

in order to emphasize the fact that a company in starting a medical policy should not go ahead blindily, take a large and valuable floor space, and spend large sums of money for equipment, etc., until the needs are actually apparent. If the intial installation is excessive and the patronage small in the beginning, then the cost of medical treatment per case will be so high as to discourage the management in continuing the department.

THE FIRST two questions that arise in establishing a medical department are: where should it be located and what are the requirements? It must of necessity be centrally located and easily accessible for all employees served. It must be situated adjacent to the offices of the other departments in the same industry so that personal contact can be had with the department heads in the daily transaction of business, thus saving a lot of useless correspondence and telephoning. The requirements of each company will have to fit the special needs. The offices should have enough windows to permit of proper ventilation and daylight. If located in the city, the offices should be high up in the building so as to escape, as nearly as may be when making examinations, the distracting street noises. The high location also prevents the fly and dust hazard and assures cleaner offices. There must be an atmosphere of cleanliness and cheerfulness. A mistake so often made in industry is locating the medical department in an out-of-the-way place that cannot be used for any other purpose. The quarters should be of such proportions and so located as to carry a respectful dignity and assure privacy to the patients. Many of the employees, especially the laborer class, have had experience with medical college dispensaries and their attending lack of privacy. The average person is naturally modest when it comes to body exposure, and objects to being together with strangers in a medical department. By having a sufficient number of rooms to permit of privacy to employees, it will eliminate the dispensary atmosphere, and with more women entering industry every day, it is essential that due study be made of the methods of taking care of these patients in the department. Toilet facilities are a paramount necessity in any medical department and should be arranged so as to permit of easy access both for male and female patients. It seems needless to state that the medical department should be comfortably heated in the winter, but in inspecting several medical departments located in old buildings, we observed that the rooms in which the patients were obliged to disrobe were decidedly chilly.

To my mind, a description of our medical department would best set forth the requirements of an industrial medical and surgical department, and as the activities of the various companies served by this department cover such a wide scope, it will fit most any industry.

The present suite of offices consists of 14 small rooms, located on the 13th floor. There is a large central reception room seating 30 people, opening off the main corridor of the building, in which the reception room clerk has her desk and makes out the patients' initial receiving cards and assigns them to their doctors. The switchboard for both outside and inter-departmental telephones is at her desk. This room has cross ventilation, permitting of pure air constantly, and has window space for plenty of daylight.

Off this main reception room, a corridor extends to the south wing of the suite of offices and another to the north wing.

In the north wing is the chief surgeon's office which is properly equipped for his executive as well as professional work. Next to it is the office of the private secretary, where all the files of the department are kept. A fully-equipped examining and treatment room for women is also located in the north suite, permitting that privacy which is so essential in a well-regulated medical office. There are also two rooms for physical therapy treatment, including electrical, thermal, light and hydrotherapy service, and furnished with Garland fracture beds.

The office of the assistant to the Chief Surgeon is in the south wing. Across from his room is the physical examination room used for examining applicants for employment. There is a suite of two rooms composed of the radiographic, fluoroscopic and dark rooms, which is in charge of the x-ray technician who has full control of the x-ray work. Also located in the south suite is the laboratory where all urine, sputum and blood examinations are made, as well as metabolism tests, and this is equipped with the necessary laboratory apparatus to perform all routine tests and bacterial examinations. In this laboratory is the sterilizing room equipped for sterilizing dressings, instruments and utensils, and where distilled and sterile water is provided for constant use, also tables, chairs and cabinets for this work. Adjoining this room is a surgical room which is in charge of the surgical nurse, who aids

the surgeons in their dressings and treatments but gives no actual surgical treatment. This room has a rubber-tile floor and is equipped with wash bowls having foot controls. At the extreme end of the south suite is located the eye, ear, nose and throat department, fully equipped for this specialty, and with a section furnished for retinoscopic and trans-illumination work.

The physical therapy apparatus consists of Morse wave generator, radiant light and heat units, thermolite lamps, Burdick Deep therapy lamps, air and water cooled quartz lamps, infra red lamps, vibratory apparatus, diathermy and high frequency coils, hot air baking equipment, and a combinestat for giving all electrical modifications of current in combinations. The physical examination rooms are equipped with automatic eye test cabinets, Eldridge green lamp and Williams test lamp for color perception, scales, spirometers, blood pressure unit, etc.

The x-ray suite is equipped with a 10-inch standard x-ray transformer and rotary converter, an automatic cassette, a stereoscope, fireproof cabinets for filing films, viewing boxes, and complete developing equipment. The rooms are painted a light green color, and all light is excluded by the glass being painted black. The equipment of the surgical room consists of white enamel operating tables, instrument tables, supply cabinet, operating stool and chair, waste receptacle, steel desk and chair, solution stands, portable light, stand for dressing feet and irrigation stand. The equipment of the eye, ear, nose and throat department is complete for the treating of all conditions arising under this specialty, and includes such apparatus as a perimeter, complete tuning fork sets, automatic eye-testing cabinets, etc.

The walls of the department for the greater part are calcimined for the sake of cleanliness, except in the reception and surgical rooms, where they are painted, permitting of their being washed frequently. The floors of the entire suite are covered with composition flooring, and the rooms are kept as sanitary as any first class hospital. There are available in this department all the physical apparatus necessary, and those competent to operate the same, for the treatment of almost any condition, and it is only in exceptional cases that a patient is referred for treatment outside of the department.

In addition to the Medical Department and its equipment is the hospital car, 40 feet long and of standard railroad construction. It consists of a waiting room seating 12 people, a treatment and examining room equipped as a model doctor's office, and a toilet room.

III—Personnel

AT ITS inception the Medical Department was a one-man department. As its services were extended and new phases of the medical policy put into operation, additional personnel was employed until at the present time the make-up of the Department consists of a Chief Surgeon, an Assistant Chief Surgeon, five doctors and one first aid director. Additional aid is secured for clerical and office work as the need arises by requisitioning employees from other departments.

The personnel of any medical department will depend upon the nature of the medical services rendered, the number of employees served, the accessibility of the employees, whether together under one roof or scattered either in the same town or in many towns, and the extent of the medical policy of the particular industry.

We are often asked by executives of large industrial companies how we select the medical men who make up our personnel, and what constitutes an industrial medical man. This question we answer from our own experience in the department and from our conception of what the applicants should aspire to. The idea has prevailed in the past, and to a large degree still exists in the minds of industrial executives, that the medical side of their business is unprofitable and the money expended is lost just the same as the money that is paid out in claims for personal injuries is lost, either in the form of damages to employees or to doctors for surgical services rendered. In times of financial stringency the medical departments were the first to feel the cut in expenses and salaries, as their services were thought to be the ones which could most easily be dispensed with by the industry. Money to carry on the medical policy was grudgingly given by some officials and only in as small amounts as possible. Income-producing departments in any industry were jealous of the medical department, and cooperation was lacking.

From this picture of the medical man in industry, it is natural to suppose that when a physician sought affiliation with industry in a medical capacity, it was for the purpose of a meal ticket or for a stopping place until a better opportunity was afforded him elsewhere. The compensation for the medical man was kept below the standard of wages of other less responsible positions. This lack of suitable compensation to the doctors in

industry led to discontent, and their services reflected their compensation. When interest in a job is lost, efficiency falls rapidly and neglect supervenes. When application is at a low ebb, incompetent work results, with employees as the sufferers. Inadequate or no treatment was given, and deplorable conditions arose in the form of disabilities and deformities. Seeing no cooperation between the officials and the medical personnel of a company, the employees soon lost confidence in the medical service, discord arose, and the prestige of the medical man in industry was lowered. In many cases unscrupulous employers used their medical departments for ulterior motives, to get rid of old, useless and disgruntled employees, so that very soon organized labor looked on all medical departments in the light of suspicion, and rightly so, for the physicians were not taken into the confidence of the executives of the company, and no effort was made to improve the class of medical service rendered.

This state of affairs was further complicated by destructive criticism, many times deserved, from the private practitioner and the medical profession at large. The physicians who were honestly and competently engaged in the practice of industrial medicine were the innocent sufferers and were criticized along with the unscrupulous ones.

Into this chaotic environment came the poorly trained medical men, the failures who were willing to work for an existence, and the medical student, fresh from school, with no idea of what was required in industrial medicine and surgery except to be able to make a superficial unvaluable medical inspection, to apply iodine and to bandage up wounds. Unscrupulous doctors bid against ethical doctors for the work, and this went to the lowest bidder, who was usually incompetent and inadequately equipped.

The insurance or casualty companies then entered into the arena to carry the medical policy for industry in its many branches. Since they were in the business to make money, it was apparent to some that they would have a larger income if they secured medical men at a low compensation to treat the injured employees of their clients. Ethical and honest work by outside physicians was rewarded by criticism from some insurance doctors and a request for reduction of bills. Then came the fee-splitting evil with all its nauseous tentacles. The casualty work was farmed out to physicians who were not equipped to do responsible surgery.

This is a history of the early days of industrial medicine and surgery, but we are sorry to say there are still in operation today many abuses as outlined, and there is great need of standardization and improvement. Big business executives look upon their medical policy as income-producing, since healthful employees make for a higher grade of efficiency and a greater production rate, and money spent for the best medical and surgical service is money well spent and such services are the cheapest in the end.

NEW discoveries and movements have always been fraught with failures, discouragements, errors, criticisms and ridicule, and opposed by those not endowed with foresight. Through such a maze of opposition struggled a great number of ethical medical men who had the confidence of their convictions. Through their struggle against adversity, and by their persistence and ability, they have been rewarded today to see their efforts have not been without avail. Industrial medicine and surgery is in its infancy, and the surface and possibilities of this specialized field of medicine are unlimited. All things continuously change. What was new yesterday is obsolete tomorrow. Who can see today how the industrial medical problem will affect the medical profession tomorrow? Today we benefit by the results of those large corporations which realized a decade ago the value of a definite medical policy for their employees on a businesslike basis. The returns to industry have been great, and tomorrow will witness vast strides over the practices in force today. It then behooves the medical profession to interest itself in this specialty and cooperate with the physicians so engaged, since there is room for all in this work if they cooperate for the good of the profession as a whole instead of for self-interest or aggrandizement. The best minds in medicine and surgery are engaged in industrial work, and it is fast attracting the better equipped medical man into its fold.

With this said, the next question is: "How is the personnel of such departments to be selected and compensated?" This we answer from our own medical personnel and our own experience of a number of years of what was required by our own particular industry in its medical policy. We are aware that we are not perfect, but improvements are made as our mistakes are revealed to us. The method of selecting personnel may fit into any medical policy and can be enlarged or reduced to meet any industry. Fundamental

requirements of the industry are the essential factors to be considered in employing medical men or women for industry.

THE TIME having arrived for employing a new doctor, the question of how to find the right man arises. This is often done by advertising in the press or medical journals, giving a description of what the position calls for and the remuneration. The results of the advertising are gratifying to the prospective employer. He will receive answers from every corner of the country, each applicant seemingly anxious to become an employee of the advertiser. As he reads the letters of application his enthusiasm wanes. Reading further, his faith in our profession begins to be shaken, as the letters show only too plainly that the writers are only mis-stating facts and their ability to do the work required. Out of a large number of applications there will remain only a few from physicians who are apparently qualified to do the work, but it is often impossible to interview them personally on account of their distant residence. This method of securing the right man is thus laborious and prolonged.

It is therefore essential that you endeavor to secure your new industrial physician from the immediate vicinity in which your industry is located. He will be acquainted with your town, will better understand the civic policy, will know business and medical men, and will have affiliations with medical societies and hospitals. The contact between the employer and his prospective medical applicant is comparatively easy, as very often his own physician may be employed, or he will know someone who will fit into the picture. Names of doctors fitted for this work are available in hospitals, and they will be only too glad to establish contact with a new source of income.

If a medical department is already established in an industry, it is essential that new personnel be recruited from among the acquaintances of its existing personnel, and the medical man in charge should make the selections. Patronage, pull or pressure should never be allowed to exert influence in placing medical men. Age, ability—both business and professional—courtesy, loyalty, tact, diplomacy, consideration, kindness, neatness and cleanliness should be the determining factors in the decision, as well as interest in and knowledge of the work at hand and an ambition to give the best there is in him to advance the work he is affiliated with. Personality and ability to instill confidence in those entrusted to his care are also essential factors for the success of the industrial medical man. These qualifications are hard to find in one individual, but there are a great number of available men endowed with these qualifications and patience will reward the efforts to discover them.

The applicant must of necessity be a graduate of a recognized medical college with pre-medical training, to insure his adequate preparation for industrial work, and must also have had internship of a sufficient duration in a general hospital to insure his becoming acquainted with hospital cases. If the hospital is one which does a large amount of casualty work or traumatic surgery, the applicant will be better equipped to that extent. It must be borne in mind that this specialty consists of more than the doctoring of injuries. Its greatest field is prevention. Examinations of employees are made to detect the unfit and the potential accident-maker and to remedy their defects. If he has not been so fortunate as to have had industrial training, his make-up should be of such character that it will be easy for him to learn and not take for granted that he knows all there is to be known of industrial surgery, as is so frequently the case with applicants.

The young applicant can adapt himself to instruction and can assimilate new ideas more easily than an older man with set ways and practices. Youth can expend greater energy in the work at hand and is more ambitious to make its mark in the world, as its enthusiasm has not been dulled. The older man, who has battled along into middle or late life unsuccessfully, must begin over again in a new sphere. Youth has its whole life ahead to think up new practices and ideas. However, one cannot be too young as his ability, while great, may not create confidence in those he is to serve. Youth is generally cheerful and optimistic and radiates cheerfulness to those it comes in contact with daily. The qualities so often in demand and found lacking are kindness and tactfulness. Hospital and dispensary training in large institutions on a charitable basis may cause a hardening of feelings and a loss of tact with human beings. When a doctor of this quality enters your organization discord arises, as the employee resents his attitude and demands that he be treated with the same respect that his patients would receive if they were private. More humane feeling for the less fortunate individual is essential. The doctor must respect the confidence of his patients and be indulgent and interested in their story. Neatness and

cleanliness of person are of vital importance to the industrial doctor. An unshaven face and grimy, ill-kept hands reflect the service rendered. The importance of clean linen, washing of the hands before examining the patient, and the use of towels to protect the patient are of paramount value. Hygiene of the teeth and mouth may seem trivial, but it has spelled failure for individuals with chronic bad breath who otherwise might have been excellent doctors.

Care and gentleness are also great assets to the industrial surgeon. Enmity has developed between patient and doctor for pulling off adhesive from a hairy surface with impunity. (The part should be shaved before applying such tape.) Enmity has also arisen by pulling off a dressing that sticks, and handling a painful area with force will break the most competently endowed physician.

Loyalty in an assistant is necessarily of first importance, and cooperation must be forthcoming. Jealousy must be combated and all trying times met with a smile.

Responding to emergency crises that arise in all kinds of weather and at all hours of the day or night will be a formidable obstacle to overcome, but the doctor must never by external actions or appearances show his patient that he resents the disturbing of his comfort to aid him.

When the doctor enters the service of any industry he should be taught the various practices and classifications of work to be performed in the industry. He should be put in the class that would best fit him for determining the fitness of the employee to do his work. An introduction to his job, and acquainting him with the officials and employees, will make him feel at home and assure him of your good will and cooperation. Many a good man has lost interest by the intolerant attitude of the lay officials.

In industrial medicine and surgery everyone must be treated alike with toleration and without prejudice. The medical executive who permits discord from these factors should be eliminated; he will sooner or later be replaced by an open-minded individual. Snobbishness and pseudo-dignity spell disaster to the physician in industry.

Our normal selves do not act a part or assume a pose; this is soon detected and confidence is lost. Executive and business ability are valuable perquisites that aid in making an industrial medical officer a success in industry, as this specialty calls for capability to meet and handle men. Many financial and economic problems may arise in the course of his administration, and if these qualities are lacking, it is better that he admit it and subordinate himself to one more fortunately endowed, than to be eliminated or demoted, with the attending humiliation.

Should the industrial medical man work part or full time on his work? Each industrial medical policy is a case unto itself, and the answer depends upon the requirements of the industry. Both have their advantages and disadvantages. In many industries only full-time men can be used, as it is necessary that they work throughout the day. If part-time men are engaged it means a larger personnel, the salaries are smaller and there are two qualities of work instead of one. The part-time man is not always available in emergencies outside of his regular hours. He is often more interested in working up his private practice than he is in his part-time work. He must neglect his industrial work if his private practice reaches a certain size. He will leave after he has been trained to the point of efficiency, and then a new man must be broken in. Many times his industrial position and his stay in any one company are short. He generally just becomes acquainted when he pulls up and moves. The full-time doctor must necessarily fill the administrative and executive position, as he must be available constantly in the routine necessary in his industry. He has more to learn about the general practice and business of the industry he represents, and it takes him a longer time to become acquainted with the routines, than the part-time man, as there are more responsibilities to his position. He can be sent out of town on work for the department or he can spend a longer time on the job without interruption than can the part-time man.

WHY should it be unethical for a doctor so desiring to devote his full time to the practice of industrial medicine and surgery, which is in itself a specialty?

Not so long ago medical and college authorities came to the conclusion that greater efficiency and learning could be had if their special professors and teachers were on a full-time basis as no onus would be attached to these gentlemen and their salaries would be paid by a corporation. After a decade in this work the fact that has been brought so clearly before our eyes is that good or poor results depend upon whether or not physicians make the work their special interest. Today the best minds in medicine and surgery are interested in industrial work, and they do not think it undesirable to be connected with large

industries in surgical and medical capacities.

The medical man in industry who is intent on making his chosen specialty a success has to apply himself more diligently and put in longer hours of study than are required of the doctor in private practice. The reason for this is that the industrial doctor is in a large family, as it were, and his errors and mistakes are ever with him and become common knowledge to employees and future patients. How long could an incompetent doctor remain in industry with his every action and practice under observation daily by his prospective clients? How true this is of fracture and hernia work in industry! A faulty result is heralded throughout the industry, and a change of doctors would be forthcoming if many such errors occurred. In private practice the average doctor's patients are scattered, especially so in a large city.

THE PERSONNEL of a medical department is chosen according to the position to be filled. We now employed five full-time surgeons. All these doctors are affiliated with medical societies and take active parts whenever possible. They also have connections with hospitals, clinics, or dispensaries, so that they maintain outside contact with teaching institutions. Post graduate work on the subjects in which they are interested is encouraged, and they have sufficient material at hand with which to write papers or deliver talks on their chosen subjects.

On account of the nature of the doctor's industrial connections, it is important that he learn how to make a systematic, thorough, physical examination for employee and customers. The Industrial Doctor is as fully capable as the doctor in private practice in making physical examinations. This statement is made to dispel the oft-repeated opinion that an industrial man becomes lazy and doesn't keep abreast of medical progress, and that he does only mediocre work. Why cannot we medical men pull together instead of forever showing jealousies and criticizing each other, much to our laymen friends' disgust?

An open mind must always be maintained by industrial surgeons when minimizing a claim of injury. They are taught that they must not be suspicious and prone to diagnose claims as malingering or neurotic. When a doctor cannot discover anything of the patient's true condition, instead of acknowledging his shortcomings and seeking assistance, he will often put the impress of a neurotic or a malingerer on the patient, his decision often being governed by those who retain him. Genial relations must prevail between the doctors in the department and employees and customers. Critical or derogatory remarks about other physicians are not tolerated. It is our desire to cooperate with them and ask their assistance in cases whenever necessary.

Once a month a round-table discussion is held by the personnel of the medical department, at which work of the preceding month is discussed —such as unusual cases, lines of treatment and new methods to be tried out. Outside physicians and surgeons of standing are invited to these meetings, and one paper is read. This gives the medical man in industry a chance to talk on cases that come up in his daily work which cannot be done at the average medical society meetings. Each of the personnel of the department in his turn must conduct a meeting, which practice prepares them to make talks and enter into discussions. This is, infact, a course in public speaking.

Remuneration for the industrial medical man should be commensurate with his training, his line of work and his age. A low wage is responsible for lack of interest in his work, makes him discontented, and fosters inferior results. It is essential that these men be paid substantial salaries for the work they do in a certain number of hours, so that they have a standard of living equal to the average so-called successful physician. The length of their service with the company should also govern their compensation. In addition to the salary, they should be allowed an expense account to meet the needs of their daily work. There must be a definite vacation period with pay, and where possible, transportation secured for them. Outside of their office work and hours in industry, they should receive an equal opportunity to do work for the industry at the same fee that is charged by outside physicians. The industrial physician builds up his outside practice many times from employees' families and their friends, and this is the source of income that makes his industrial work attractive. The personnel of the medical department is given the opportunity to do all the outside work for the companies that they can possibly handle.

NOW the criticism arises that the industrial medical man is usurping the prerogatives of the private physician by his connection with industry and that he takes the patients that would belong rightfully to the outside physician

if there were no industrial doctors. However, in order to ascertain the true facts in this matter, a thousand people, applying for different classes of work, were asked the name of their family doctor. Over 50% of them replied that they had no private doctor, while 10% said they looked to healing without the use of drugs, and had no definite medical adviser.

In addition to the active personnel in the medical department, there is maintained an associate staff of some 100 doctors who are available for emergency work and examinations of claimants, who are paid on a fee basis. These doctors are paid for their services the same as private practitioners and then, too, they are certain of payment, as is not so often the case in private practice. They are paid when they take care of a case.

A consultation staff is also maintained in the various specialties, assuring available and competent consultation when necessary. Their fees are not fixed by the department, but it is left entirely up to them to render a reasonable bill. One of the duties of the Chief Surgeon of the department is to approve every bill for medical services before it is paid, and only in an exceptional and rare case has it been necessary to reduce a doctor's statement as rendered. It is true that advantage is taken once in a while by certains doctors with a mercenary idea of their importance, who submit bills way out of reason, but even these cases are amiably settled.

In concluding as to the personnel of the Medical Department, I believe I can state that the day is not far off when medical departments in industry will be standardized and rated, as hospitals are rated today. Big business men are awake to the great economic value of efficient and completely organized medical policies, and they have themselves endeavored to bring to a higher plane the status of industrial medicine. If there has been poor and incompetent medical and surgical work in industry in the past in certain companies it is not so much the fault of the employer of labor as the lack of cooperation of the medical profession toward improving conditions.

From the gentlemen who are giving their best to industrial medicine and surgery comes the plea that better cooperation be forthcoming from all concerned in this work, and that thoughtful consideration be given to the fact that in industrial medicine and surgery the percentage of incompetents is no higher than in other branches of medical science.

Operation of Laws Providing Benefits in Case of Injury, Sickness, Old Age, and Death *

IN GREAT BRITAIN benefits are secured to the employed population and their dependants in case of physical incapacity and death under four principal Acts: the Workmen's Compensation Act, the National Health Insurance Act, the Old-Age Pensions Act, and the Widows', Orphans', and Old-Age Contributory Pensions Act. Following is a brief description of the provisions of each of these Acts, together with statistics illustrating their scope, income, and expenditure:

WORKMEN'S COMPENSATION. *Legal Provisions*: Workmen's compensation was instituted in 1897.

The right to compensation is conferred on all employed persons, save non-manual workers whose remuneration exceeds £350 a year.

Insurance is optional. Most employers insure with insurance companies or mutual indemnity associations. The chief insurance companies have agreed to fix premiums in such a way that 62½% thereof is expended on compensation.

Compensation is payable for personal injury by accident arising out of and in the course of employment, and for injury to health from specified occupational diseases. It consists of cash benefits only.

During total incapacity the injured workman receives from the fourth day a weekly payment varying from 75 to 50% of his wages according as his wages vary from 25s. to 50s. a week or more; maximum: 30s. a week. During partial incapacity he receives a like percentage of his wage loss.

The amount of compensation payable in case of death varies according to the wages of the workman and the degree in which his survivors were dependent on him. Where survivors wholly dependent are left, the compensation is a lump sum of three years' wages; maximum: £300; minimum: £200. In addition, children each receive compensation at the rate of 15% of wages until they reach the age of 16. Maximum total compensation: £600.

Statistics: It is estimated that about 16,000,000 workmen are covered by the legislation, that the amount of compensation paid in 1931 was about £7,500,000, and that the total cost to employers in that year was about £11,000,000.

* International Labour Review.

Detailed statistics of the number of compensable cases and of the amount of compensation paid are collected for seven important branches of economic activity: shipping, factories, railways, docks, mines, quarries, and constructional work (excluding building). These statistics are summarized in the following table:

Year	Number of persons covered (000's)	Incapacity		Death		Total	
		Cases	Compensation (£000's)	Cases	Compensation (£000's)	Cases	Compensation (£000's)
1913[1]	7,509	476,920	2,767	3,748	595	480,668	3,362
1920[1]	8,348	381,986	5,222	3,531	756	385,517	5,978
1925	7,541	473,055	5,778	3,030	865	476,085	6,643
1927	7,403	455,852	5,553	2,567	763	458,419	6,316
1928	7,434	461,485	5,684	2,735	773	464,220	6,457
1929	7,450	478,602	5,762	2,819	808	481,421	6,570
1930	7,182	458,509	5,664	2,621	752	461,130	6,416
1931	6,914	396,571	5,402	2,315	665	398,886	6,067

[1] Including Ireland.

Compensation In Seven Important Branches of Economic Activity

Compensation: Between 1917 and 1923 the rates of compensation were raised in order to take account of the increase in the cost of living. In 1924 the scale was permanently modified and the amount payable in case of death was considerably increased.

NATIONAL HEALTH INSURANCE. *Legal Provisions:* Compulsory health insurance was instituted in 1911.

Insurance is compulsory for all employed persons save non-manual workers whose remuneration exceeds £250 a year. Persons whose terms of employment secure to them equivalent benefits are exempted.

The collection of contributions and the service of cash benefits is undertaken by about 7,500 approved mutual benefit societies freely established by groups of insured persons. Medical benefit is administered on a territorial basis by about 200 local insurance committees representing insured persons, doctors, and the local authority. Societies and committees are supervised by the Ministry of Health and the Department of Health for Scotland.

The scheme is financed by a joint contribution from the insured person and his employer and by a state subsidy.

	Employer	Insured	Total
Man	4½d.	4½d.	9d.
Woman	4½d.	4d.	8½d.

The joint contribution is payable weekly as in the table above.

The state pays a proportion (one-seventh for men and one-fifth for women) of the cost of benefits and administration, and, until 1931, the entire cost of central administration.

The benefits comprise medical, sickness, disablement, maternity, and additional benefits.

Medical benefit consists of medical treatment and supply of drugs, afforded as long and as often as necessary.

Sickness benefit is a weekly payment from the fourth day of incapacity for 26 weeks at the rate of 15s. for men and 12s. for women (10s. for married women in 1933 and after). The qualifying period for the full rate of benefit is 104 contribution weeks.

Disablement benefit is a weekly payment equal to half the rate of sickness benefit for the further duration of incapacity. The qualifying period is 104 contribution weeks.

Maternity benefit consists of a lump sum of £2 for an uninsured wife and £4 for an insured wife.

Any approved society which, at its quinquennial valuation, is found to have a disposable surplus may use it for the provision of increased cash benefits and for paying part of the cost of dental, ophthalmic, hospital, and other treatments.

Year	000's	Year	000's
1914	13,687	1928	16,526
1920	15,279	1929	16,748
1925	15,835	1930	16,997
1927	16,498	1931	17,232

Number of Insured Persons

Year	Contributions	Interest	State subsidy	Total	Funds at end of year
1914	16,797	618	5,737	23,152	22,983
1920	22,688	3,271	10,206	36,165	81,441
1925	27,721	5,644	8,073	41,438	126,627
1927	26,382	5,571	7,573	39,526	125,178
1928	25,979	5,660	7,135	38,774	126,429
1929	26,005	5,535	7,631	39,171	125,696
1930	26,039	5,930	7,335	39,304	126,426
1931	25,769	6,202	7,074	39,045	127,936

Receipts and Accumulated Funds (£000's)

Contributions: As from July, 1920, the rates of the weekly joint contribution were increased simultaneously with the increase of benefit rates, from 7d. to 10d. in the case of men and from 6d. to 9d. in the case of women. They were decreased to 9d. and 8½d. respectively as from January, 1926, because, with the introduction of old-age pensions at 65, disablement benefit ceased to be payable at that age instead of at 70 as formerly.

State Subsidy: As from July, 1920, the

amount of the state subsidy in the case of women was reduced from one-fourth to two-ninths of the cost of benefits and their administration. As from April, 1922, the special subsidy granted in 1920 towards the increased cost of medical benefit was discontinued. As from January, 1926, the amount of the state subsidy was reduced, from two-ninths to one-seventh, in the case of men, and to one-fifth, in the case of women, of the cost of benefits and their administration.

Accumulated Funds: The accumulated funds have remained at about the same level since 1925, their growth being checked by the allocation of large sums for the provision of additional benefits.

Year	Benefits					Administration	Total
	Sickness	Disablement	Maternity	Medical	Other		
1914	6,458	184	1,368	5,620	817	3,002	17,449
1920	6,163	2,002	1,924	10,017	1,084	4,979	26,169
1925	10,339	5,103	1,704	9,428	937	4,908	32,419
1927	13,034	7,175	1,728	9,784	3,980	5,189	40,900
1928	11,276	6,146	1,750	10,093	3,045	5,263	37,573
1929	13,215	6,432	1,735	10,338	2,783	5,395	39,898
1930	11,173	6,333	1,802	10,282	3,351	5,658	38,599
1931	11,087	6,072	1,762	10,683	3,310	5,693	38,607

Expenditure (£000's)

Sickness, Disablement, and Maternity Benefits: As from July, 1920, the rates of these benefits were increased by about one-half. As from July, 1921, the figures include the expenditure on supplements to the statutory benefits, granted by way of additional benefits.

Other Benefits: As from May, 1921, sanatorium benefit was abolished. As from July, 1921, additional treatment benefits have been provided.

NON-CONTRIBUTORY PENSIONS. *Legal Provisions:* Non-contributory pensions were instituted in 1908.

They are payable as of right to British subjects who have resided in Great Britain for 12 years out of the 20 years preceding attainment of the pensionable age and whose means do not exceed a prescribed amount.

If a person has been in receipt of a *contributory* old-age pension up to the age of 70 (see "Contributory Pensions"), he is eligible for a non-contributory pension from the age of 70 at the full rate without any condition as to nationality, period of residence, or means.

Non-contributory pensions are administered by the state in conjunction with the local authorities.

The whole cost of non-contributory pensions is borne by the state.

Non-contributory pensions are payable for life from the age of 70 (50 in the case of blind persons).

The full rate of the pension is 10s. a week (£26 5s. a year). In the case of persons who have not hitherto been in receipt of a contributory pension, the full rates is reduced by the amount of any yearly means in excess of £26 5s. (excluding the first £39 of unearned yearly means).

Year	Number of beneficiaries			Cost (£000's)
	Pensions at full rate	Pensions at reduced rates	Total	
1913	738,646	43,283	781,929	9,822
1920	774,937	53,425	828,362	20,696
1925	1,041,100	29,993	1,071,093	27,017
1927	972,621	23,357	995,978	26,808
1928	926,287	24,508	950,795	25,475
1929	901,263	25,472	926,735	24,377
1930	855,204	25,097	880,301	23,632
1931	804,831	24,827	829,658	22,219

Number and Cost of Non-Contributory Pensions Awarded Subject to Nationality, Residence, and Means Conditions

As from July, 1926, persons insured under the contributory pension scheme and their wives became entitled to non-contributory pensions without any condition as to nationality, residence, or means. Year by year the number of pensions awarded subject to conditions diminishes while, as the next table shows, that of unconditional pensions increases.

Year	Number	Cost (£000's)	Year	Number	Cost (£000's)
1927	289,681	6,022	1930	551,851	13,044
1928	366,786	8,578	1931	647,795	15,630
1929	446,596	10,541			

Old-Age Pensions Payable From Age 70 to Persons Previously in Receipt of Contributory Pensions

CONTRIBUTORY PENSIONS. *Legal Provisions:* Widows', orphans', and old-age contributory pensions were instituted in 1925.

Insurance is compulsory for the same persons as are liable to National Health Insurance, and also for some classes of employed persons not so liable.

Contributions are collected with those of health insurance.

The funds are administered, and the pensions are awarded, by the Ministry of Health and the Department of Health for Scotland.

The scheme is financed by a joint contribution from the insured person and his employer and by a state subsidy.

The joint contribution payable weekly is as follows:

	Employer	Insured	Total
Man	4½d.	4½d.	9d.
Woman	2½d.	2d.	4½d.

In principle the state pays the difference between expenditure and the income from contributions.

In particular it pays the whole cost of pensions granted in respect of risks which matured before the commencement of the scheme (January, 1926). Moreover, it pays the whole cost of non-contributory pensions from the age of 70 awarded to persons previously in receipt of contributory pensions (see "Non - Contributory Pensions").

The benefits comprise pensions between the ages of 65 and 70 for insured persons and their wives, and pensions for widows and orphans of insured persons.

The old-age pensions for an insured man and his wife amount to 10s. a week each. The qualifying period is five years' insurance.

The widow of an insured person is entitled to 10s. a week until remarriage *plus* 5s. for the first and 3s. for every other child under 16. The orphan's pension amounts to 7s. 6d. a week. The qualifying period for widows' and orphans' pensions is three years' insurance.

The widow of a man who was insured under National Health Insurance but who died before the commencement of the contributory pension scheme is entitled to a pension only if she has attained the age of 55 or has a child under 16 dependent on her.

Year	000's	Year	000's
1927	17,206	1930	17,423
1928	17,078	1931	17,653
1929	17,200		

Number of Insured Persons

Year	Contributions	Interest	State subsidy	Total	Funds at end of year
1927	23,254	1,097	4,000	28,351	37,426
1928	23,300	1,798	4,000	29,098	42,699
1929	24,077	1,999	4,000	30,076	46,330
1930	23,438	2,208	9,000	34,646	46,369
1931	22,871	2,164	10,000	35,035	40,539

Receipts and Accumulated Funds (£000's)

State Subsidy: In 1930 the subsidy was raised from £4 million to £9 million a year, and thereafter increases by £1 million annually until a constant figure of £21 million is reached; this increase was necessitated by a large extension of the right to widows' pension effective in 1930.

Accumulated Funds: The decrease in accumulated funds in 1931 is due partly to the fact that expenditure had already begun to exceed income, and partly to the transfer of £1,125,000 to National Health Insurance in order to strengthen its finances against the effects of unemployment.

Year	Pensions		Administration	Total
	Widows' and orphans'	65-70		
1927	8,044	3,004	900	11,948
1928	9,147	13,655	1,024	23,826
1929	10,614	14,731	1,100	26,445
1930	16,890	16,362	1,355	34,607
1931	21,087	17,348	1,305	39,740

Expenditure (£000's)

Widows' and Orphans' Pensions: As from July, 1930, elderly childless widows of persons liable to National Health Insurance but deceased before the commencement of the contributory pension scheme became entitled to widows' pensions; hence the rapid rise in expenditure. The same fact is reflected also in the figures of the following table:

Year	Widows	Children	65-70	Total
1927	194,498	262,938		457,436
1928	233,351	272,255	529,663	1,035,269
1929	280,162	285,445	569,952	1,135,559
1930	534,626	308,486	629,705	1,472,817
1931	669,171	326,557	663,892	1,659,620

Number of Pensioners

Methylene Blue in Aniline Poisoning

WILLIAMS and Challis describe a case of aniline dye poisoning in a student who had been handling parabromaniline and parabromorthosulphanilic acid. Intense signs and symptoms of pigmentation of the skin, headache, stupor, nausea and vomiting were relieved promptly by the intravenous injection of a 1% solution of methylene blue (methylthionine chloride, U.S.P.). It was shown by spectroscopic studies of the blood that the poisoning was due to parabromaniline and that the parabromorthosulphanilic acid was non toxic when applied to the skin. Animal experiments indicated that methylene blue injected intravenously into a rabbit in approximately twice the strength of that given to the patient did not affect the absorption spectrum of normal blood, but that, if methylene blue is mixed with normal blood in vitro, the spectrum from such a mixture seems to be a composite of the spectrums of methylene blue and normal blood.—*Journal of Laboratory and Clinical Medicine* (November, 1933).

Who's Who in I. M. & S.

—The Reactions, Each Upon the Other, of an Alert, Creative Mind and Two Decades of Industrial Medicine—

HERE is a man to whom Prof. Walter Pitkin's unusually-coupled adjectives apply; without any pun on the first of the two words, even though he is a prolific writer, here is a man "voluminously energetic." The principal term is sustained by the record of what he has done and what he is doing, its modifier by the nature of the forces that have moved him in the past and are moving him now.

These forces have the tremendous subjective volume that is the mathematical product of (1) continuity in their long reach, (2) breadth in the scope of their expression, (3) depth in the sureness with which they fix upon essentials. For there is more than length in his career, and more than breadth in his responses to opportunity — these dimensions are the measure of only his energy's *quantity*.

HART ELLIS FISHER

Searching completeness of thought, meticulous analysis of facts, logical mental processes—keenly responsive, however, to the vastly tempering influences of the human equation as it is disclosed individually and *en masse*—are some of the elements of the *quality* of his capacity.

He is remindful of "T. R." in the way his mind surrounds and fully encompasses the matter under consideration, although—and fittingly for an M. D.—the diversification of the subjects of his intellectual attention is neither as wide, nor as sudden, as was characteristic of the strenuous "Teddy."

And another difference exists, perhaps, in the fact that while, in a very marked sense, "T. R." was often, this man was *never*, an opportunist. Throughout his story — long here, because no sketch of a "complete" man should be less complete than its subject—there is the continuously golden thread of the definite lifetime purpose which alone will impart to any energy the fullness of things been and things done that lifts it from the area of mere quantity to the third dimension of sound and solid volume.

HART ELLIS FISHER was born at San Antonio, Texas, in October, 1886. The public schools of Lima, Ohio, and the public utilities owned and operated by his father gave him his first opportunities of education. He did as innumerable other boys have done—carried papers, presumably a morning route because in the evenings he was a gas-lighter, getting up with his ladder to the old Welsbach's that antedated the arc lamps in city streets. Schooling—on up through high school at Joliet, Illinois—was never interrupted, but vacations were given over to work. He was successively, and successfully, water boy in the construction department, track spiker, street paver, lineman, material clerk, construction foreman, and manager of an amusement enterprise—meanwhile finishing high school to graduate in 1905, finding time to be one of the championship football team when Joliet High took the title in 1904, and having the qualities (possibly through a subconscious expression of the attraction of like for like) which led to his selection by the student body as one of the six state high school representatives to attend "T. R.'s" inauguration in 1905.

Dartmouth, '06, and Northwestern University Law School, '07 and '08, only confirmed an early and abiding predilection toward medicine. And so he matriculated at Hahneman Medical College and Hospital, and in 1912 was graduated

therefrom as M.D. Then, after a period as Senior House Surgeon at Flower Hospital, New York, he took up post-graduate work at the New York Post-Graduate Hospital. In 1913 he established himself in his own practice in Chicago.

Early in this venture on his own he became affiliated with the Chicago Surface Railway Lines as an emergency surgeon. But soon the Elevated Lines wanted to install a Medical Department, and he left the street car company, and his own practice, to "head up" the new department.

HE SAW a double-edged opportunity in this position. In addition to the call to pioneer in industrial medicine, there was the deep attraction of the human interest relations, not only with the employees but also with the public, which the new work involved. Experiences shoulder to shoulder with wielders of pick and shovel, in the handling of groups on railroad construction, and in dealing with the public had whetted certain administrative capacities to which the Medical Department of an urban railway ought to give maximum expression.

So he started in, and among those results of his labors, his unflagging interest, the development of his administrative ability, and his "voluminous" energy which will profit others as well as those with whom he works is that remarkable crystallization of "20 years of experience" which he calls "The Medical Department Manual," now appearing section by section, in *Industrial Medicine*.

There was much of pioneering. His first medical survey, made in 1914, of 5800 employees was pioneer. So was his inauguration of the annual survey of the same group—continuously since as much a part of routine as the running of the L. trains. So, in the medical propaganda of education, were the 16 radio talks he made over station WORD in the early days of broadcasting. So was his first aid school for laymen. And so was his research, which has produced among other improvements mentioned in his Manual, a non-adhering gauze dressing, an electrical burn treatment and certain safety spectacles—but read his Manual.

This in itself was trail-blazing and trail-marking work of the size and kind for a creative, alert, administrative mind to revel in and thrive upon. And Dr. Hart Fisher reveled, and throve —taking these and innumerable other things in an upward stride which was paced to a steady development, not only as a pioneer in industrial medicine, but also as physician, surgeon, administrator, educator, organizer, citizen, and individual human personality.

A MAN who is interested in the public is likely to be public spirited. And so it was like Hart Fisher to volunteer when the Army sent out its call for M.D.'s in 1917. He enlisted on the day war was declared; was 1st. Lieut. in the first Medical Officers Training Camp at Ft. Riley, Kans., and then Regimental Surgeon, 356th Infantry, 89th Division, at Camp Funston, ranking as Captain. He served 18 months in the A. E. F. overseas; was Chief of the Surgical Staff at Camp Hospital No. 38, in France, at Chatillon-sur-Seine, and, after the armistice, Surgeon, Trench Artillery Center, at Vitry-sur-Seine. The sincere and efficient service characteristic of him was rewarded by his being selected as one of the first medical officers to be returned home after the memorable events of 11-11-'18.

HE IS NOW Chief Surgeon of the Chicago Rapid Transit Company, the Public Service Company of Northern Illinois, the Chicago, Aurora & Elgin, Chicago, North Shore & Milwaukee, and Chicago, South Shore & South Bend Railroads, the Metropolitan Motor Coach Company, and 11 other utilities in the Chicago area; Consultant Surgeon for six more; Local Surgeon for another three. And he is an Assistant Surgeon at St. Luke's Hospital, Attending Surgeon at Henrotin Memorial, Associate Surgeon at Provident Hospital and West Side Hospital, and Consultant Surgeon at Rogers Park Hospital—with an outstanding reputation in traumatic and industrial surgery.

With all he has to do, he still finds time for a keen and energetic interest in matters of civic and public welfare. He speaks often to clubs and to trade and professional audiences, writes constantly for the utility magazines and bulletins, less often for *Industrial Medicine*. In the latter his articles on "Periodic Medical Examinations" (October, 1932), "Are We Old At Forty—A Study in Reaction Time" (November, 1932), "Surgery Clinic for Small Industries" (December, 1932), "Health and Business Recovery" (September, 1933), and "Electrical Accidents" (October, 1933) made a profound impression, especially the last-named.

And he finds time, too, for committee activities. Among the more important of these: in the National Safety Council (of which he is Advisory-Medical Consultant) he is chairman

of the Health Committee in the Public Utility Section, and, in his own companies, is chairman of the Inter-Company Medical, the Insurance, the Central Safety, the Employees' Activities, and the Employees' Relief Committees. Likewise he is a member of numerous professional committees. As an executive of the claims division of the Electric Railway Association he organized the Medical Section and was its first chairman. In the National Electric Association he was a member of the Employees' Relations and Employees' Health Committees.

HE IS A FELLOW of the American Medical Association, the American College of Surgeons, the Institute of Traumatic Surgery, the Chicago and the Illinois Medical Societies, the American Association of Industrial Physicians and Surgeons, the Association of Railroad Chief Surgeons and the Chicago Society of Industrial Medicine and Surgery.

He has been Medical Officer of the Chicago Elevated Post, American Legion, since its organization; and is a member of Phi Alpha Gamma and Alpha Delta Phi fraternities, and of Paul Revere Lodge A. F. & A. M., Chapter, Commandery and Shrine. He is Episcopalian always; and, except for whole-hearted support of the present administration, is Republican most of the time.

He was married in 1911 to Caroline Hamilton Graff, of New York and Middletown, Ohio. They have one son, Edward C.; and if Dr. Fisher has any special hobby it is that son, and any special joy it is being with him—both are fond of fishing. He is interested in children, especially the underprivileged. The Union League Club's Foundation for Boys had much of his time and attention in its early days. And he is Medical Director in connection with the Katherine Budd Memorial Home for Children at Libertyville, Illinois.

HART FISHER'S attitude toward industrial medicine is governed by two principles which, from out of his own deep and varied experiences, he has reason to believe are fundamental.

The *first* of these is that industrial medicine in its application to any aggregate of employees should be, in primary essentials, *preventive* medicine.

He, therefore, preaches, as it were, what he practices; advocates the annual physical survey; the compiling and keeping, in utmost permanence of form, of the completest possible records of each and every examination of, or other contact with, an employee; the constant study to find the causes of accident proneness, so that the accident itself may be headed off; and the continual effort toward such improvement of working conditions as will yield the response to environment that is most satisfactory to both employer and employee.

The *second* is that industrial medicine in its application to the individual human being, who is himself or herself the employee, should be essentially *constructive* medicine.

Thus he seeks always, in the general way, to preserve and maintain the *status quo,* until, in the specific details, he can find out what the trouble is and how it can be remedied. But here he goes deeper than the physical, because he wants to know not only what the trouble is, but also "*why?*" The individual readjustment—even rehabilitation—begins when he can answer the last question. And it continues, if necessary, clear on past the physical, to the point of mental, psychological, readjustment — to another kind of work, or environment, or outlook upon life, or even a new set of habits of thought—in so far as an absorbing interest, expressed with infinite patience and consummate tact, in the personal problems of the individual can bring this about.

It is a specific illustration in this respect that Dr. Fisher has some very definite ideas about "retirement age" under industrial pension plans. He has been years ahead of current opinion on this point, but the rapid developments of recent months are proving him right. To his way of thinking, the retirement age of any person is properly set, not at any arbitrary attained age, such as 65, or 70, or even 75, but instead, at the age when the curve of that person's ability to discharge his duties is definitely beginning the downward course that will never again turn upward.

And this is a matter so purely personal, and so much medically personal, that only the M.D. can say when the proper retirement age for the individual human being before him is arrived at. But more of this in a later issue of *Industrial Medicine.*

MEANWHILE Dr. Fisher's development of the *individual* application of industrial medicine continues its successful expression: realization, by each employee, of the very best that is in him (or her) for as long a period as the employee himself (or herself), with the aid

of patience, tact, knowledge and understanding on the part of the employer, can make possible.

He is only 47; the full picture of his accomplishments must await complete unfolding—in the to-be-hoped-distant future. Still young, still energetic, still fired with the vision of so much that remains to be done, he has nevertheless made a strong, important and lasting impression upon industrial medicine; has proved that its practice is a career; and—because he has builded well along the lines of the inevitable developments of this transition period of national economics—has yet a career before him, big enough for even the "voluminous" energy of his extremely agreeable personality to find its full expression.

Significances and Coincidences

SEVERAL years ago we had a long and earnest argument with a C.P.A., attempting to prove to him that an assembled "proper personnel" was an *actual asset* to any concern that had it. He remained unconvinced. To our question, "How much would it cost a railroad, for example, to replace all at once every employee now in its service?" he answered, "But that kind of wholesale and complete replacement will never be necessary." This was typical of his refusal to accept any such possibility, because he didn't want to admit any such value. But the times and their exigencies are postulating our argument very effectively. *First*, have been the sincere efforts of literally thousands of employers to preserve their organizations intact throughout the late depression; efforts which are costly in direct proportion as they are sincere. And *second*, is the forthright admission by "big business" of the fact that, while "plants can be replaced readily . . . to assemble proper personnel and to create an organization to run those plants is the work of years."

A COUNCIL for Unemployment Insurance (said to be financed entirely by employers) announces 'that the management of industry has not provided work security or created work opportunities for those who are able, willing and eager to work. Hence, industry must be compelled to do what it has thus far failed to do. Work or relief must be provided.'

Of a piece with the 10,001 indictments of "the management of industry" for the 10,001 things that are wrong with life as it affects the individual, this indictment once more blames industry. It would be such a relief—to tired ears that have to keep on hearing about the duty of industry to do this and that, the dire happenings that will come to pass "unless industry," etc. —if someone would arise and point out:

1. *What is industry?*
2. *What is the duty of industry?* and
3. *Whence came that duty?*

With these things clearly defined, the mechanism of the best method of discharging the duty can be reasonably and sensibly decided upon. Possibly NRA will evolve an answer or two!

Meanwhile the M.D.'s haven't yet found a cure for cancer. Hence, "must they be *compelled* to do what they have thus far failed to do" — a cure for cancer "*must* be provided." That's a fair parallel?

LOOKING back from February, 1934, over the months that have passed since fateful '29, one cannot help but feel some pity for the plight of the economists who so seriously attempted to apply the old rules to the new situation. Prediction after prediction went wrong; formula after formula refused to work; diagnosis after diagnosis proved incorrect; panaceas simply didn't "pan."

The situation is reminiscent of an incident of 30 years ago. A freshman in engineering was weaving homeward toward 5:00 A.M., after one of those nights of serious preoccupation which were viewed then, as more or less necessary to a proper technical education. The early morning way-freight was in, and as he passed the station the legend painted under the window on the side of the locomotive cab caught his eye. It was like this:

$$F^5 \text{ an } M \frac{28}{32} 57.5$$

Bewilderment was followed by interest, study, action. Addressing the world, he said grimly, "I'll solve it!", and, oozing assurance, he went over close, produced from his pocket a piece of billiard chalk, used it on the cab window—and proceeded homeward with that sense of duty done that comes from the satisfaction of having overcome one of life's serious problems.

The engineer climbing up to his cab a few moments later was amazed to see the legend read:

$$\sqrt{F^5 \text{ an } M \frac{28}{32} 57.5} = 0$$

Whether we like to admit it or not, the efforts of self-styled "doctors of the times," "students of economics," "scientific economists," and

what not — with startlingly few exceptions — have accomplished just as much as the inebriated youth beside the locomotive cab, i.e., the square root of their nostrums is exactly nothing. Were it not so seriously eloquent of economist insufficiency in general, it would be amusing to witness the anxiety of self-appointed "experts" to square their prognostications with the rapidly unfolding drama of events, which at this writing are repeating, with no more than certain variations of the general theme, the economic and national history of the past.

HON. HENRY D. SAYER, formerly New York State's Industrial Commissioner, is quoted in a recent *Bulletin of the Self-Insurers Association* as follows: "If an 'all-inclusive' occupational disease law is passed, without any safeguard in it, there is no insurance company that will be able to write compensation insurance."

Pneumonokoniosis (Silicosis) —Bibliography & Laws—

"PNEUMONOKONIOSIS (Silicosis) — Bibliography & Laws" will be the probable title of an important and timely book shortly to be published.

The compilers are Dr. George G. Davis, Chief Surgeon, Illinois Steel Company, Chicago, Ella M. Salmonsen, Medical Reference Librarian, The John Crerar Library, and Joseph L. Earlywine, of the Illinois Bar, Chicago.

This book is an exhaustive, and comprehensive summary of all the *references of the world's literature* from the earliest times to date on "Pneumonokoniosis (Silicosis)." It includes also a large section devoted to the laws of the United States on the subject.

The section of the book given over to law covers the occupational disease, the workmen's compensation, and the common law, in the United States; the state laws being carefully and plainly abstracted; the abstract in each instance being followed by citations to all adjudicated cases.

The bibliography covers the literature of the world—from the first modern reference in 1556, to January 1, 1934. There are a few citations from ancient literature also.

The first reference is to Agricola's *De Re Metallica*, which was translated in 1912 by Herbert C. Hoover and C. L. (Mrs.) Hoover.

The second reference was in 1557, and the third was more than 100 years later, in 1671.

This reference work is designed for its value to doctors, lawyers, industrial executives, insurance men, industrial boards, state commission officials and research workers; in fact to everyone in any way connected with an industry in which the inhalation of dust is an occupational risk.

Beginning with 1935, supplemental references will be issued.

Pending the announcement of publication, inquiries may be addressed to Dr. George G. Davis, Room 1757—208 S. La Salle St., Chicago, Ill.

Containers of Poisonous Fumigants

RECENTLY there occurred two incidents at quarantine stations of the Public Health Service which suggest the advisability of marking containers of poisonous products with permanent warning marks in lieu of the common practice of depending entirely on printed paper labels pasted on the containers.

At the San Pedro (Calif.) quarantine station, a fumigator was ascending a boarding gangway with both arms full of two and one-half pound containers of hydrocyanic acid gas to be used in the fumigation of the ship. The gangway broke, precipitating the employee and the several containers into the water, and it was impossible to recover all the containers. The second incident occurred during the tropical storm that visited the mid-Atlantic seaboard the latter part of last summer, in which the fumigant storage house at the Baltimore quarantine station was practically washed away, and many tins containing hydrocyanic fumigant material were washed overboard, some of which could not be recovered. These containers were hermetically sealed tins containing the deadly gas of hydrocyanic acid and were identified by paper labels pasted thereon. It was to be expected that these paper labels would wash off and the tins thereupon would become unidentified and particularly dangerous. In both instances the medical officers of the Public Health Service gave publicity, through the press, to the dangerous character of the lost containers.

A manufacturer of fumigant products has taken the step of stamping into the tops and bottoms of the containers the words "Poison Gas" and the skull and cross bones. This procedure is recommended for all poisonous or dangerous products. — *U. S. Public Health Report* (November, 1933).

Our Problem Page

—*VI. Carbon Bisulphide Poisoning*—

THIS is the sixth of a series of articles in which important problems of industrial medicine and hygiene will be discussed. In the form to be used, the problem in its essentials will be briefly stated, and the discussion will follow. Suggestions from readers will be welcomed and given due consideration in the selection of future subjects.

PROBLEM: We have a number of employees who are exposed to carbon bisulphide in various manufacturing processes. Please give information relative to the incidence, symptoms, exposure limit, prevention, and treatment of carbon bisulphide poisoning.

DISCUSSION: Carbon bisulphide poisoning is a relatively rare form of industrial poisoning, which was quite common 15 or 20 years ago. About two years ago the *Ohio Health News* for June, 1931, called attention to the reporting of six cases of carbon bisulphide poisoning to the State Department of Health of Ohio. The experience of that department of 1920 up to 1931 showed that only three cases of this kind of poisoning had been reported during that interval.

There are two types of carbon bisulphide poisoning recognized, acute and chronic. Acute industrial poisoning is rare. Acute cases show the following chief symptoms: (1) circulatory disturbances, such as pallor, headaches, throbbing of the temples, pains in the neck, temples and frontal region, palpitation, and fainting; (2) drowsiness; (3) digestive disturbances, especially nausea, lack of appetite, repeated vomiting, occasionally diarrhea, and sometimes colic and constipation; (4) nervous manifestations, especially incoordination, weakness in the legs, signs of great fatigue, unsteady gait, impulsive acts, and mania with homicidal and suicidal results are known. There are also marked hallucinations of sight, hearing, taste, and smell. Death may follow during a convulsion or during a coma. Usually the breath has the obnoxious odor of sulphides.

In the chronic type of carbon bisulphide poisoning, there are two stages, excitement, and depression. During the stage of excitement the victim becomes talkative, loud and unduly exhilarated. After this comes faintness, giddiness, drowsiness, exhaustion, and headache. There is considerable irritability, alternating with depression; there is a great deal of sleeping in the daytime, because the patient cannot sleep at night, and he has bad dreams. Most persons thus afflicted complain of feeling "drunk." Usually new men are the ones most afflicted. Hysterical manifestations are particularly common and more so in females. Some workers complain of peculiar numbness and tingling sensations of the skin, sometimes an entire absence of pain in certain portions of the skin surface, cramplike pains, spasm of the face muscles, and trembling. There is often a drunken gait, exaggerated reflexes, and what is known as a Romberg sign is usually present. Digestive disturbances include vomiting, loss of taste, diarrhea which usually alternates with constipation. The pulse is rapid and there may be abundant nosebleed at times. Hearing is early impaired and more often than sight. Disturbances of sight including dimness of vision, blind spots, disturbances of color fields, appear later, and are apparently due to changes in the central nervous system.

In the stage of depression of the acute type of carbon bisulphide poisoning, there is often a loss of weight, pallor and weakness, a softness of the muscles with muscular tremor, various types of peculiar sensations in the skin, great depression, weakness of memory for words, a reversion to baby talk, and general apathy. Organic nervous symptoms are very common consisting of partial and complete paralyses, especially of the extensor groups of muscles, leading to wrist drop, a peculiar gait, and later what are known as contractures. In attempting to use the lips in whistling, the lips tremble quite violently. The knee jerks are absent, as are other deep reflexes. The patient cannot read because of dim vision, although the pupils appear normal. Deafness may be marked. Sexual power is entirely lost, sterility appearing in females and atrophy of the testes in males.

The amount of carbon bisulphide inducing symptoms is variable, but Lehmann, a prominent German investigator, has shown that one part of carbon bisulphide per million parts of air will produce mild symptoms, while 1½ parts will produce severe symptoms. It is common to find on various occasions, as much as two to three

parts per million in certain work processes and in certain industrial groups.

The prevention of carbon bisulphide poisoning is fairly easy. Because the vapors are very heavy, having a specific gravity of 2.6, it is recommended that workers stand on raised platforms and not in pits or low places. Employees should be allowed only short exposures at this type of work. Impervious clothing, such as rubber gloves and boots should be worn. Local exhaust systems will solve the problem of carrying out vapors, particularly if a down draft be used in this type of system. Hands and fingers should be kept out of carbon bisulphide solutions.

The treatment of acute poisoning resolves itself into a few simple procedures; removal into fresh air, until patient has apparently recovered from his severe effects; the giving of warm baths if there is excitement, and the giving of cold applications if there is stupor. If the breathing has stopped, artificial respiration should be administered. In subacute or chronic cases the patient should quit work at once. He should be given large quantities of meat, eggs, and fish in the diet to prevent the shrinkage or atropy of muscles, along with such drug therapy as strychnine, quinine, phosphorus, iron, iodides and arsenic. For the various muscular conditions, the use of galvanic electricity, vapor baths, and massage is indicated.

Bone Button Infection in Industry

By Dr. Claude William Chamberlain,*
Assistant Superintendent of Social Hygiene, Division of Communicable Diseases, Illinois, Department of Public Health, Chicago

DURING the first 10 months of operation of a bone button factory in Buchanan, Va., 210 cases of a queer skin disease broke out among the workers. The clinical study of these cases made by Dr. George B. Lawson and Dr. M. S. Stinnett lead to the diagnosis of erysipeloid, probably due to the bacillus of swine erysipelas. This is primarily a communicable disease of hogs caused by erysipelothrix rhusiopathiae. It is sometimes called "diamond skin disease."

The disease was first studied by Pasteur in 1882. He demonstrated a method of immunization by use of an attenuated culture which was obtained by passing the organisms through rabbits, which are relatively resistant to this infection. Some doubt exists as to the purity of the cultures used by the great French scientist, and the first complete description of the bacillus of swine erysipelas is credited to Loeffler in 1885.

Frederick Loeffler was an assistant to Robert Koch in Germany and was so single-minded that he sat on a high stool for years and years looking through a microscope. Roux and Behring were the discoverers of diphtheria antitoxin but they never could have done it had it not been for the work of this almost unknown fiercely-moustached military doctor. He was working at the right hand of Koch when the latter was running down the tubercle bacillus.

Jensen, in 1891, described a diamond-shaped skin lesion in hogs due to the bacillus of swine erysipelas. In 1892, Bang described a verrucose endocarditis caused by this organism. Prausnitz, in 1921, collected data on approximately 100 cases of human infections with this organism. In the same year Dumont and Cotoni described a case of meningitis and isolated a similar organism from the spinal fluid. In 1926, Klauder, Righter and Harkins published a complete accurate description of a number of infections occurring among New Jersey fishermen. In 1930, Stefansky and Grunfeld reported 200 cases of infection with bacillus of swine erysipelas occurring among fresh water fish handlers in Odessa. Ingestion of raw sausage made from the meat of swine dying with erysipelas has been reported as causing intestinal infection in man.

The disease has been reported in workers with bone meal fertilizer, handlers of wet bone, fishermen, fish market workers, and bone button makers.

At the time that Lawson and Stinnett made the study of the button factory outbreak in 1931, a survey of the plant was made and each process of operation was studied. This factory formerly operated in Pennsylvania and many of the employees reported that they had had similar infections while working in the previous place. The first case in the Buchanan outbreak occurred about three months before the opening of the plant in a man engaged to load and unload bone. A splinter of the material spiked his shoe and infected his foot.

The largest number of cases occurred during November and December, but during no season was the plant entirely free of cases; 50% of the cases gave a history of a previous attack, frequently on the same hand, indicating that there is little or no general immunity from infection.

Only adults were employed. Both sexes were

* Radio Talk, WCFL, February 16, 1934.

affected, but the majority of the cases occurred in males. No women, however, were employed in operations requiring the handling of raw wet bone. Three out of six negro workers, handling wet bone, were infected.

Bones of swine and cattle, used for buttons, were obtained from various places, including England, Uruguay, Argentina, and Seattle, Washington. The bones were received in carload lots and were well cleaned, though occasionally somewhat "green" and odorous. After reaching the plant they were soaked in large vats of warm water to soften before sawing. Both long and flat bones are used. They are sawed into thin strips on circular power saws, which are kept wet by streams of water. Minor injuries to the hands of workers are frequent. At the punching machines, similar accidents are numerous. Following the punching of the buttons from the bone they are dried and sent to the sorters and finishers where they are polished and dyed. The sorters and finishers handle only dried buttons, and injuries are relatively infrequent; only 3% had been infected.

The clinical manifestations of the disease were a progressive local swelling, dusky purple discolorization with pain, and extreme tenderness of the infected part. There was local heat but no elevation of body temperature. Suppuration was extremely rare, and there was only occasional slight lymphangitis and lymphadentis. These symptoms appeared usually three or four days following a superficial injury, usually to an exposed part. The duration of the disease ranged from nine to 21 days. In approximately 90% of the cases the lesions occurred on the hands. There were five cases of eye malady, conjunctivitis and very severe, resulting from bone dust infection, and three severe cases of bronchitis from inhaling the bone dust. In one case the lesion occurred on the knee following a bruise and in addition there was the case referred to where a splinter of bone lacerated the foot.

Samples of material for bacteriological examination were obtained from vats, the teeth of circular saws in a moist state, waste bone material at the button punching machines, and pulverized bone meal used for soil fertilizer.

Dr. G. F. McGinnes, of the State Department of Health in Virginia, in reporting the study of the outbreak in the *American Journal of Public Health*, recommended the heating of all bones entering the plant in the soaking vats to a temperature of 144 degrees for at least two hours. He states that the bacillus of swine erysipelas was isolated in the laboratory, a service which is extended by the Illinois State Department of Public Health, in its work of disease prevention in this state.

Epidermophytosis

By Hart Ellis Fisher, M.D., F.A.C.S.

ONE OF THE most common forms of foot trouble is that caused by a fungus, producing "athlete's foot." At least 50% of all people are afflicted with this condition, men more often than women. This fungus is found commonly in gymnasiums, locker rooms, bathrooms, and shower bath stalls, where people go about in their bare feet. It may be on one person's feet and cause little inconvenience, yet this person can infect others by their coming into contact where he has walked in his bare feet. Members of the same family may be infected through their home bathroom floor and bath mats. The infection usually appears in those areas of the person's body where moisture is most prevalent: between the toes, under the armpits, and on the groins. It may appear anywhere on the body and usually manifests its presence by itching, the skin appearing deadlike, moist, whitish in appearance, with the skin peeling off; or the skin may be mottled and reddish in appearance. Blisters may form with small cracks present. The odor is offensive and the toes may feel hot and painful. Secondary infection may develop, which causes greater heat, redness, pain, and some swelling.

Prevention is far better than cure and calls for the most careful foot hygiene. The feet should be kept clean with soap and water, with careful drying between the toes, and daily changes of shoes and stockings, with white stockings preferred. Floors and furniture of gymnasiums, etc., should be cleansed daily with sodium hypochlorite solution, and receptacles provided containing a 5% solution of sodium hypochlorite, made fresh daily, so that feet may be soaked for a few minutes before and after using the bath facilities.

This is one of the most intractible of diseases and recurrences are frequent. Self medication has been exploited, especially over the radio, and while most any antiseptic will appear at first to obtain improvement, the condition may be only arrested and break forth when thought cured. A physician's advice is the cheapest in the long run. Some of the remedies recommended for a cure are nightly foot baths in hot boracic acid

solution, potassium permanganate solution, 1-4000 applied daily, daily foot baths of 5% hypochloride solution for 15 minutes to be alternated during the day with the use of astringent powder made of equal parts of tannic, boric acid and zinc oxide, this sprinkled between the toes and on the infected parts.

Shoes that are infected should be placed in an air tight container and fumigated with formaldehyde to destroy the fungus. In industry, search should be made at the pre-employment medical examination and at the subsequent periodical medical survey of all employees for this condition. Thus not only is a potential accident maker so affected discovered, but also infection of other members of the family is prevented. This condition often becomes very disabling and causes an economic loss, both to the employee and employer.—*Public Utilities Sectional News Letter.*

Hernia and Lymphatic Leukemia

SOME TIME ago on January 12, 1931, a wagon driven by Stanley Witkowski was struck by an automobile operated by the defendant. Witkowski received lacerations about the head, face, mouth, lower lip and tongue and was severely injured over a large area of the abdomen and right thigh. He remained in bed from the date of the accident until February 1, 1931. No physician saw him during that period, except a physician sent by the defendant to examine him, who, according to the record, seems to have found merely that the patient's lip was infected. February 1 a physician found the patient acutely ill, with considerable swelling and infection of his mouth and tongue, very extensive contusions of the abdominal wall, marked ecchymosis on the right side, and a hernia in the right inguinal region. Witkowski was taken to a hospital, February 2. February 9, an operation for hernia was performed, and on that day symptoms of anemia appeared. June 20, he was readmitted to the hospital, his physician having determined that he was suffering from lymphatic leukemia. He died, January 6, 1932, his death being attributed to that disease. Witkowski's executrix prosecuted the suit he had begun, and the jury gave a verdict in her favor. The defendant appealed to the Supreme Court of Errors of Connecticut.

The defendant claimed that the evidence did not show that the hernia was caused by the accident. In addition to the testimony as to the decedent's good health before the accident and his physical condition and pain in the region of the lower abdomen immediately after it and up to the time of the operation, said the Supreme Court of Errors, the physician who operated expressed the opinion that the hernia was caused by the accident. The lymphatic leukemia from which Witkowski died was attributed by the witnesses for the defendant to causes other than the accident, but physicians for the plaintiff were of the opinion that the accident caused it, through the resultant infection of the wounds of the lips and mouth. They testified not that the disease might have resulted or was likely to have resulted from the injury but in substance that in their opinions, taking into consideration all the facts presented and considering every other hypothesis suggested, it was reasonably probable that the disease did result from it and that the injury was its direct cause. Such testimony is sufficient, said the court, to remove the case from the realm of speculation and to present a question of fact to be determined by the jury, and the trial court did not err in refusing to set aside the verdict. — *Witkowski v. Goldberg* (Conn.) 163 A. 413—Abstracted, *Journal of The American Medical Association,* (July 29, 1933).

Medical Changes

MEDICINE, like all the other activities of life, is undergoing a tremendous revolution.

To preserve the individuality of practice to the end that a physician may derive happiness from the practice of medicine, some system must be developed whereby all members of the profession may have an opportunity to compete, one with another, on a fair, honest and open basis.

Any contract agreements between industrial organizations or groups, desiring health insurance, must be under the direct control of the organized units of the profession.

Service must be given to the public which will include everything connected with medical care, this service to be efficient and honest.

The spread of the cost of medical care should be so organized that a large number of people will pay for the care of the few who become ill.

This system of practice should be confined at first to those whose incomes are in the lower brackets and later can extended to all persons who desire this insurance.—Dr. George W. Swift, *Northwest Medicine* (September, 1933).

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EDITORS:
VOLNEY S. CHENEY, M.D., F.A.C.S.
HART E. FISHER, M.D., F.A.C.S.
OTTO P. GEIER, M.D.
LE ROY P. KUHN, M.D., F.A.C.S.
RICHARD S. FARR, M.D.

MANAGING EDITOR:
E. A. WARD, B. A.

CONSULTANT:
C. O. SAPPINGTON, M.D., DR. P.H.
Consulting Industrial Hygienist

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"THE MANAGEMENT *which follows the short-sighted policy of employing the medical man it can obtain most cheaply, is sure to get as much ability and professional skill as it is willing to pay for and no more; and it may even find that by such a policy it has done more harm than good. In industrial work second rate physicians are a menace as great as, or even greater than are second rate executives of any other type.*"—Magnus W. Alexander.

EDITORIAL

Can't Collectivize Medicine

INTERESTING, and prophetic, is this comment in a letter from a journalist written in November, 1932:

"Washington from now on is bound to figure about all other cities in questions of industrial relations. The politico-economic trend is going to determine merchandising and manufacturing policies far in advance. * * * The departments of industrial relations, including industrial medicine, workmen's compensation, increasing socialization of industry as a matter of self preservation, are alive as never before."

What has the "politico-economic trend" done to industrial relations? What is the effect of NRA and its alphabetical associates on the normal and usual contacts between employer and employee? What portion of the inevitable result will be the making of a permanent change in those contacts?

One has only to keep up with current news to appreciate that these are undergoing an extensive change. The developments in the larger employment situations have emphasized not the individual personal contacts, but the representative and collective contacts. The reluctant acceptance of the automotive code as the only one specifying that the employer may hire, discharge or promote an employee on the basis of individual merit, sustains the conviction that the "politico" part of the trend is firmly toward labor organization. The unmistakable effect thus far is that organization has been powerfully encouraged.

This being true in respect of the matters and things—such as wage rates, working hours, working conditions, etc.—which are or can be made the subjects of collective bargaining for the best possible terms, how long before it will be equally true with respect to all other industrial relations manifestations? How long before pensions, group insurance, vacation policies, and the many other important and helpful, if more or less minor, expressions of employer interest and employee cooperation, will be collectivized? Numerous dispassionate observers see them already on their way to that condition; the trend —economic only to the extent that it can remain economic under "politico" pressure—is inevitably in that direction.

In a manner of speaking, however, "it's an ill wind—". As the writer of the quoted letter infers, industrial medicine was long considered a department of industrial relations. It may have been. But whatever its place in time past, it stands out now, in time present, as the one phase of the employer-employee relation that cannot be collectivized. For, above and beyond all other contacts between the one who works and the one for whom his work is done, it involves things not only personal but also *private*. The traditions, the ethics, and the fact of the privileged nature of communications between company employee and company doctor throw the importance of industrial medicine into high relief against the background of the collective trend of every other aspect of the working relation.

This, in turn, implies an enlarged definition of the field of industrial medical practice. For it brings the physician in industry into direct handling of the psychological, emotional, inner life of the employed individual to the ultimate extent that is necessary to enable that individual to real-

ize his best capacity in the right kind of work. In this respect no one has the opportunity of the physician because no one else has the knowledge and training to enable him to probe as deeply with as much certainty of correct disclosures as the physician. And no one else can do as much as the physician, for the same reasons that sustain his opportunity.

Thus industrial medicine is emerging from its departmental status in connection with industrial relations. It will, in all probability, not stop until it puts all such relations on the essential basis where the physician in industry has as much to say about them as he should have.

Ingested Aluminum

A GREAT deal of study has been devoted to the effects of ingested aluminum and also the retention of aluminum within the human body. From time to time confusing reports have been issued because of the difference in interpretation of the effects and retention of aluminum in human tissues. The older literature on the fate of orally administered aluminum is confusing because of the employment of inadequate methods for determining aluminum in tissues; the new published evidence based on the application of more refined methods of analysis bears out the statement that the concentrations of aluminum in biological matter must invariably be very low.

Recently Schwartze, Cox, Unangst, Murphy, and Wigman* have analyzed tissues from experimental animals to get accurate data concerning the retention of aluminum in tissues, with the following results:

The aluminum content of fresh tissues of guinea pigs receiving no added aluminum is about 0.4 part per million or less.

The carcasses of growing guinea pigs on a diet containing no added aluminum have a higher content of aluminum than those of the adult animals.

Feeding of large amounts of soluble aluminum salts produces a barely detectable deposition of aluminum in the soft tissues (less than 0.5 part per million) and somewhat larger amounts (from 0.5 to 1 part per million) in carcasses.

No systemic pharmacologic effects can be ascribed directly to absorbed aluminum.

Aluminum does not appear to be cumulative in the tissues.

No harmful effects can be expected from soluble aluminum occurring naturally in foods or introduced by utensils into a diet of normal phosphorus content.

Especially significant seems the following statement issued by the authors: "Considering the relatively small amount of aluminum that would get into the diet as a result of corrosion of aluminum metal in contact with food in comparison with the large daily intake of phosphorus, there appears to be no possibility of causing phosphorus deprivation with a normal dietary. Since there is no evidence in our data that the consumption of a large amount of aluminum can lead to any primarily pharmacologic action in the system, there can, therefore, be no medical objection to the consumption by human beings of a small amount (relative to the phosphorus content) of added aluminum, as the factor of safety is ample."

From these experiments, therefore, and from the statement made by these authors, it can be concluded that under ordinary circumstances only a small amount of aluminum can get into the daily diet, and since there is no deleterious reaction on the tissues and, further, no cumulative effects, there appears to be no health hazard ascribable to this source.

The Effects of Dusts

THE physiological response of body tissues to dusts of various kinds has been a subject of great interest in the past few years. However, because of the length of time required to obtain the reactions by inhalation methods, injection of various dusts into the peritoneal cavity of experimental animals has appeared to give the most promising results. Added to this is the fact that the reaction is essentially the same microscopically as that produced in the lungs, and the gross appearance of the dust nodules can be sufficiently differentiated to afford a means of classifying the physiological response to various dusts.

Miller and Sayers* have recently studied the effect of intraperitoneal injections of various types of dusts in experimental animals, using the dusts of calcite, limestone, precipitated calcium carbonate, gypsum, Portland cement, quartz, chat, flint, soapstone, carborundum, jewelers' rouge, anthracite coal, bituminous coal, and precipitator ash. In these experiments there were

* Schwartze, E. W., M.D., Cox, Gerald J., Unangst, Richard B., Murphy, F. J., and Wigman, Helen B.: The Extent of the Retention of Ingested Aluminum. *J. A. M. A.*, 101: 1722-1725 (November 25, 1933).

* Miller, John W., M.D. and Sayers, R.R., M.D.: The Physiological Response of the Peritoneal Tissue to Dusts Introduced as Foreign Bodies. *U. S. Public Health Reports*, 49: 80-89, (January 19, 1934).

three types of reaction, an absorption or dissolution of the dust, a proliferative reaction, and an inert reaction.

A definite quantity (0.2 g) of dust in suspension was injected intraperitoneally into guinea pigs.

Dusts of two particle-size groups were used—one of screened material with particles less than 43 microns (325 mesh), and the other of air-separated material with particles varying from less than two to eight microns in size.

The animals injected with the coarser material were examined seven, 14, 30, 56 and 112 days after injection, and those treated with the air-separated material were examined after seven, 14, 30, 56, and 90 days.

The response caused by the dust in the peritoneal cavity was constant in all of the animals injected with an individual dust and could be classified as an absorption, proliferative, or inert reaction.

In the absorption reaction the injected dust disappeared from the peritoneal cavity without the production of scar tissue.

In the proliferative reaction the nodules produced by the dust continued to increase in size up to 112 days after injection, the maximum duration of the tests in this series.

In the inert reaction the amount of injected dust remained approximately the same in the peritoneal cavity throughout the various periods, but the nodules became more flattened and fine particles of dust were carried over rather extensive areas in the peritoneum by phagocytes.

Calcite, limestone, precipitated calcium carbonate, gypsum, and cement exhibited an absorption reaction.

Quartz, chat, and flint produced a proliferative reaction.

Soapstone, carborundum, jewelers' rouge, anthracite coal, bituminous coal, and precipitator ash were inert in reaction.

The authors concluded that the tissue of the peritoneal cavity responds actively to a dust introduced as a foreign body, and this response is of such a character that it may be used as a basis for the classification of industrial dusts from a physiological standpoint. In this report, dusts of uniform chemical composition or those definitely known to produce or not to produce silicosis were used, and for this group the reaction occurring in the peritoneal cavity was uniform and constant for each dust. It seems probable, in view of the nature of the reactions, that dusts of mixed chemical composition will produce responses similar to those found in this series of dusts.

It is significant that tests of longer duration are now in progress, although for purposes of obtaining a definite response to any dust, 90 days appears to be a sufficient interval between injection and examination.

This technique, therefore, affords a fairly rapid pathological test by which the physiological response to various types of industrial dusts may be determined.

Sickness Records

SICKNESS records in industry deserve a great deal more attention and study than they have previously received. To make them of value, an analysis must include the various kinds of factors, such as age, occupation, department, length of employment, sex, and other items.

Brundage* has analyzed the sickness records of various public utilities, bringing out some interesting facts in regard to the comparisons of these records and the necessity for considering the effect of such factors as sex and occupation upon illness rates, when developing preventive methods among industrial employees. Not only do these factors have some relationship to the sickness rates, but also such rates are considerably influenced by the differences in sickness insurance plans of various companies. However, in these instances in which Brundage has made comparisons, despite such differences in the insurance plans, the sickness curves are very much alike.

Among other things Brundage discovered that the differences in sickness rates appear to be wide enough to indicate that sickness - preventive work, if it is to be effective in public utilities, must be based on the facts obtained by analysis of sickness experience according to sex and occupation.

It should be worth knowing, for example, what occupations in these utilities showed the greatest excess in illness of a digestive nature, or the highest rates of influenza, or the kinds of work that were associated with a minimum frequency of nervous exhaustion. Knowledge of the causes of the higher rate of cases lasting longer than one week in the manual than in the non-manual group should prove helpful in solving whatever problems may be reflected in such differences in the incidence of illness.

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* Brundage, Dean K.: Comparability of Sickness Records of Public Utilities. *U. S. Public Health Reports,* 48: 1095-1103, (1933).

The sickness rates of employees of companies granting sick leave for a certain period at full pay were found to be not comparable with the illness rates recorded for groups of employees receiving only a certain percentage of full pay during disability. When the incidence rates for illnesses of different duration were computed for each utility for which sickness records were available, three different types of illness curves resulted. The type of sickness curve and principal features of the sick-benefit plan appear as important considerations when determining the comparability of the sickness rates of one company with those of another.

In two public utilities in which the sickness data appeared to be comparable, the illness rates of male non-manual workers were compared with those of females and of males in manual occupations. These three groups of employees showed such differences, both in the frequency of total sickness and in the rates for certain groups of diseases, as to indicate the desirability of periodic analysis of sickness frequency in different occupations as a basis for more effective administration of the medical and health services maintained for employees of the industry.

It would appear therefore that there is no standard procedure for examining the sickness records of any given industry when comparing it with a like industry; the basis for a logical comparison can only be reached after examining the data in each instance and subjecting the figures to a close examination in order to determine the differences; after these differences have been observed, it will then be apparent, as Brundage has indicated in this experience, what further procelures are indicated.

Erysipeloid

ERYSIPELOID, also known as swine erysipelas, or "diamond skin disease," is primarily a communicable disease of hogs, caused by an organism known as erysipelothrix rhusiopathiæ. In the past it has been reported among various types of industrial employees who come into contact with hogs or among fresh water fish handlers, and even from the ingestion of raw sausage meat made from infected swine.

A survey of the literature shows that the disease was first studied by Pasteur in 1882, later by Loeffler in 1885; since these studies other reports have been made.

McGinnes and Spindle* have recently reported the occurrence of 210 cases of erysipeloid among workers in a bone button factory during the first 10 months of operation. An epidemiological investigation was conducted and bacteriological confirmation was made of the organisms in this instance by agglutinating the organisms by swine erysipelas serum obtained from Dr. John Buckley of the Bureau of Animal Pathology, U. S. Department of Agriculture.

In summary the authors conclude that in this series of 210 cases of an erysipeloid condition in bone button factory employees, there was a close correlation with the handling of wet bone and occupations in which injuries were frequent. Repeated attacks of the disease were frequent, indicating that there was little or no local or general immunity produced by an attack. The bacillus of swine erysipelas was isolated from one case and from samples of bone, bone material, and bone waste collected at various stages in the manufacture of buttons. For ridding the plant of the infection, it was recommended that all bones be heated in the soaking vats to a temperature of 144° for at least two hours.

Because of the relative infrequency of this industrial disease, its etiology, characteristics, and other factors should be kept in mind when considering industrial diseases of uncertain origin or diseases of similar exposure types.

Estimation of Basophilic Cells

THE estimation of basophilic cells (reticulocytes) in the blood by an examination of an ordinary blood film has become a very important procedure in industrial hygiene, especially in the diagnostic work relating to the examination of employees exposed to lead hazards.

The principle involved is to be able to make this estimation in such a way as to arrive at a fairly accurate figure of the percentage of young or embryonic red cells, and also to be able to use the same material for differential white cell counts, as well as to observe the other characteristics of the red blood cells.

Jones* has been successful in working out such a technique, based principally upon the method of Ehrlich originated in 1881. This consists mainly in fixing one-half of the film on the slide by methyl alcohol, while the other portion of the slide is air-dried. The staining technique is based upon the use of the Sussmann-Weindel

* McGinnes, G. Foard, M.D., and Spindle, Forrest: Erysipeloid Condition among Workers in a Bone Button Factory Due to the Bacillus of Swine Erysipelas. *American Journal of Public Health*, XXIV: 32-35 (January, 1934).

* Jones, R.R., M.D.: Estimation of Basophilic Cells (Reticulosytes) in Blood by Examination of Ordinary Blood Film. *U. S. Public Health Reports*, 48: 1011-1020 (August 18, 1933).

solution of toluidine blue, methylene blue and borax, which furnished in the experimental work the most uniform results in the examination of both fixed and nonfixed films.

The technique for estimating the number of reticulocytes per thousand red blood cells is simplified by using the counting ocular designed by Ehrlich which was originally used for determining the ratio between red and white corpuscles in stained dried mounted preparations.

Among the advantages of this method, the author cites the following:

The preparation may be made and examined at the convenience of the technician, and is relatively permanent, so that re-checks may be made by the same technician or by others interested.

It is possible to use the same slide for estimation of reticulocytes; differential white blood count; platelet estimation; and study of red blood cells for polychromatophilia, achromasia, anisocytosis, poikilocytosis, and punctate basophilia.

A report is made to the effect that this technique was used in examining blood films taken from persons exposed to lead, and that most of such examinations showed an increase in the total number of reticulocytes.

Comparison of the vital staining and ordinary blood film techniques shows: (a) the average percentage of erythrocytes with reticulations was about the same by both methods; (b) there was a high degree of correlation in the results taken individually; (c) there was less variability in the results obtained by the ordinary blood film technique than by vital staining.

Since this technique was based upon an exhaustive review of the literature and a trial of the various methods which have been used, it will quite likely be generally adopted as the standard laboratory procedure where estimations of this character are necessary.

Dermatitis in Rubber Workers

BECAUSE industrial dermatitis stands in the first position of frequency of all reported occupational diseases, any experience which may shed some light on the casual relationships of this condition may add to our general store of knowledge on this highly important subject.

Of considerable interest, therefore, are the study and report by Schwartz and Tulipan* in which an experience of a plant employing about 150 workers, engaged in the manufacture of sheet rubber goods, has been described.

This company, which has been in existence over 20 years, and engaged in the manufacture of a rubber product without the use of accelerators or antioxidants, and in vapor curing, had never known dermatitis occurring among its employees previous to the time of the reported outbreak.

About two weeks after it began the manufacture of a new rubber product containing three accelerators and an antioxidant, there developed an outbreak of dermatitis among the men handling this new product. None of the employees who did not handle this product developed dermatitis.

Patch tests on five of those who had the dermatitis at the time the investigation was begun showed that four of them were sensitive to Accelerator "A" and one was also sensitive to the antioxidant used. One was sensitive to all the accelerators and to the antioxidant. The one man who showed no reaction under the patches was entirely cured of his eruption at the time when the patches of accelerators and antioxidant were applied.

Patch tests with Coumarin were negative in all cases.

From these facts it seems reasonable to deduce that the outbreak of dermatitis in this plant was mostly due to hypersensitivity of the affected men to the accelerators and the antioxidant, especially to Accelerator "A." This accelerator has been implicated before as the cause of dermatitis.

All cases except one had fully recovered and were at work at the time this report was written. They have either developed an immunity against the chemicals, or the onset of cooler weather may have stopped the action of the chemicals on the skin. The fact that one of the mill men showed no reaction to the patch test shows that he is now immune.

It has been noted in other cases of occupational dermatitis that continued exposure will, in some cases, cause an immunity that lasts for a short time. In many occupations the onset of cool weather greatly lessens the number of cases of dermatitis.

This experience shows the necessity of checking up carefully the types of processes and materials used, in working out the casual relationships which may affect the health of the employees exposed.

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* Schwartz, Louis, M.D., and Tulipan, Louis, M.D.: An outbreak of Dermatitis among Workers in a Rubber Manufacturing Plant. *U. S. Public Health Reports*, 48: 809-814. (July 14, 1933).

Industrial Medicine Digest

Spontaneous Fractures

DRS. KURT GARVE AND C. E. EARLY, *in Illinois Medical Journal*, (August, 1933): — Using medical case reports, and citations from legal cases, the authors bring out the pertinent points regarding the medico-legal aspects of so-called "spontaneous fractures" as follows:

1. The proper name for "spontaneous fracture" is pathologic fracture, false fracture, pseudo-fracture.

2. False fractures are always due to either general affections, infections, or hereditary dispositions, or they are due to local infections, tumors or foreign bodies.

3. A pathologic fracture requires a definite pathology as underlying cause in order to justify such a diagnosis.

4. The facts of the case of *Newton v. Industrial Accident Commission of California et al.* (Cal.) 267 Pac. 542, are as compatible with a true traumatic fracture caused by violent pull of the muscles of the thigh as with the theory of a pathologic fracture in absence of the showing of some inherent pathology of the bone or bony system.

5. The absence of excoriations, bruises, or contusions is not proof that the fracture has not occurred on account of violent means.

6. A refracture occuring during the yet incomplete process of healing should not be called a pseudo-fracture, and should be regarded as the interruption of the normal process of rehabilitation of the respective bone.

7. From the fact that a refracture occurs through a previous fracture line, no conclusion can be drawn exclusively that such fracture and refracture are due to "spontaneity."

8. The syndrome of lack of signs of external violence, of absence of a fall, and of visible extraordinary motions, or any other happening of such character, does not conclusively prove that the fracture or refracture is pathologic as such term is used in medicine.

9. The medicolegal aspects of pathologic fractures are not properly recognized by attorneys, claim adjusters, and physicians and surgeons.

10. Pathologic fractures are more common than one may think.

11. Pathologic fractures may lead to suits for personal damages, erroneously supposed to be due to malpractice, or they may become matters of concern in criminal, other civil, and workmen's compensation cases.

12. X-ray pictures are of paramount value in cases of false fractures.

13. In most cases a properly trained medical man is able to recognize a pathologic fracture.

14. Attorneys, claim adjusters and medical men should go into details of life history of claimants where there is a suspicion of a pathologic fracture.

15. Slight exertion, mild injuries, undernourishment, nervous disease, and other conditions should put the investigator on his guard as to the possibilities of a pathologic fracture.

16. Claim adjusters, attorneys, physicians and surgeons should always keep in mind the possibility of a pseudo-fracture whenever the case seems to be an extraordinary one from the standpoint of causes of such fractures.

Fracture Treatment and Medicolegal Work

DR. EDWARD ADAMS, *in International Journal of Medicine and Surgery*, (July, 1933): — The author believes that the generally accepted principles of fracture treatment from a medicolegal aspect, should be considered under the following headings: (1) history; (2) physical examination; (3) reduction; (4) x-ray; and (5) end-results.

As regards the history, definite and complete notes should be made at the time the case is first seen, and it is far from wise to wait until several days have elapsed before transcribing findings for record purposes.

Associated with the history of the case, it is necessary to inquire whether the injured person has ever sustained a previous fracture, because in many instances, an old fracture is claimed to have been caused by a recent injury or accident.

A physical examination, axiomatically, should be complete and thorough, noting at the time whether there is any swelling or discoloration of the part involved, how extensive it is, whether or not a joint is involved, and if there are any compression symptoms resulting from the fracture in question. Careful comparison with, and measurement of similar long bones, uninjured, is essential, and markedly helpful in arriving at conclusions.

Reduction should be accomplished as early as possible, yet the exception to this rule is made when one is dealing with an impacted fracture or a depressed fracture of the skull. Herein of course proper reduction can only be accomplished by operative measures.

In dealing with fractures, especially those of the skull, stereoscopic plates should always be taken, and in young people before the age of puberty, linear fractures of the skull are very often mistaken for normal suture lines, and in dealing with individuals past the age of 21, linear fractures have to be differentiated from normal sinus grooves. In children, fractures near the epiphysis of the tibia are often overlooked or may be mistaken for an Osgood-Schlatter disease. Fractures along the epiphyseal lines are also frequently overlooked. In dealing with fractures of the lower extremities a very important rule to remember is that an x-ray should be taken of the normal part in order to compare it with the injured one. In dealing with fractures of the spine, lateral as well as antero-posterio, plates should be taken in order to determine the exact findings.

In fractures of the long bones, one deals not only with the question of a permanent shortening taking place, but also the cosmetic as well as functional results have likewise to be considered. In dealing, for instance, with a fracture of the clavicle with overriding, in a female, the cosmetic result obtainable plays an important role regarding the question of damages that may be assessed. Furthermore, one's vocation has to be considered in the functional result sought, as it can be readily seen that a fracture, for example, of one of the fingers of a pianist, would certainly cause much more functional disability than that of a person whose fingers were not used so much nor so necessary in his vocation. The percentage of disabil-

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ity that may result is at times very hard to measure and to decide upon, and this point will be taken up more in detail subsequently.

The medicolegal aspects of fractures, as far as the doctor is concerned begin, as stated before, at the time the case is at first seen, therefore accurate and thorough notations should be made and jotted down for record purposes at the time of the first examination. When the doctor appears in court there are a number of important factors which have a great bearing on the outcome of the case in question. In the first place, the doctor's appearance, his demeanor in court, the way he has prepared his part of the case and the impression that he creates upon the jury, by giving a straightforward recital of the facts, will at once have a decided bearing regarding the credibility of his testimony and belief in his integrity. This is true of all witnesses, but particularly so of the medical witness. Facetiousness while on the witness stand should never be indulged in, and before the doctor testifies, he should consult with the attorney of the side he is testifying for, and the two (the doctor and lawyer) should have a complete and thorough understanding as to how and to what, the doctor is going to testify, in all particulars, based upon careful analysis of the case to be tried.

Leg Fractures

DR. EDWARD T. NEWELL, *in International Journal of Medicine and Surgery,* (August, 1933):—The diagnosis, prognosis and treatment of fractures of the lower third of the leg are considered in this paper.

Diagnosis of these fractures is made in the usual way, by inspection, by palpation, and by the use of x-rays, anterior-posterior and lateral views, with the exception that such fractures should not be subjected to manipulation to elicit crepitus and undue mobility to arrive at a diagnosis—the latter procedure is painful, dangerous and unscientific.

The prognosis depends on several factors: (1) the extent of the trauma causing the fracture; (2) whether one or both bones are involved; (3) whether the fracture is transverse, oblique, spiral or the joint involved; (4) whether compounded or comminuted and complicated by multiple fractures in other parts of the body and with great tissue trauma; and (5) whether the patient is old or in a poor physical condition from disease, etc.

The treatment depends largely on the kind of fracture, the injury to the soft parts, the condition of the patient, and finally, the time that has elapsed since the fracture has occurred.

The custom of setting the fracture as soon as seen should be adhered to, as in all other fractures, unless contra-indications are present. Should the leg be greatly swollen, with poor circulation, and 12 to 24 hours have elapsed since the occurrence of the fracture, the leg should be placed in a fracture box or Cabot splint, dressed and external heat applied.

The author concludes that: (1) fractures of lower third of leg require accurate x-rays for proper treatment, x-ray during treatments when case is dismissed; (2) simple fractures, transverse of one or both bones with or without displacement are usually satisfactorily treated with the application of well-padded plaster cast; (3) fracture of both bones of leg, if oblique and overriding may require manipulation with manual or pulley traction or fracture table, and should, where feasible, be put up in plaster; (4) compounded fractures, crush fractures, fracture-dislocations, or those that cannot be held in plaster, will require Steinmann pin tongs or open operation for best results; (5) all casts must be cut as soon as they harden; must be well padded; (6) correct alignment here, as elsewhere in fracture surgery, is more important than absolute approximation; (7) local or general anethesia may be used, depending upon the case, and the experience and technic of the attending surgeon.

Control of Occupational Diseases

DR. W. IRVING CLARK, *in National Safety News,* (July, 1933):—Although there are a few occupational diseases not due to the materials used in manufacturing, the majority of diseases due to occupation result from the effects of some irritating or toxic substance which enters into the formula or is a by-product of production.

In addition to such chemical substances, there are the dusts and various hazards such as infection from anthrax and the danger of electric shock or burn which must be considered. Obviously, in manufacturing plants where toxic or other harmful substances are present, some form of medical supervision of both the workers and of the hazard to which they are exposed must be provided.

Each manufacturing plant has its own hazard. It is, therefore, not necessary for the industrial physician to be versed in the action of every form of toxic or injurious substance known, but only of the action and danger of those present in the plant or plants over which he has supervision.

The industrial physician must know every chemical and physical health hazard in his factory. He obtains this knowledge by conference with the production departments, by personal inspection and by conference with the factory laboratories if such are maintained.

Having located all possible hazards, his next step is to check the mechanical devices in operation upon which the protection of the worker depends. Such devices would be hoods and fume removal apparatus, dust collecting systems, etc.

Next he must determine the efficiency of these devices, as inefficient mechanical devices may be more dangerous than no protection at all, because of the feeling of safety which their presence produces.

Following this, a careful review of the various production operations will show certain operations where no mechanical protection is possible, but

where dangerous exposure can be avoided by the wearing of respirators, gloves, or other methods of personal protection. Thus workers in bakelite, who frequently develop an irritating rash, may be protected by requiring them to wear one piece overalls with a snug swathe about the neck, gauntlet rubber gloves, and goggles.

The overalls and swathes must be laundered frequently and the workers obliged to take a shower after working. Such rules must be enforced by the foreman, but it is the duty of the industrial physician to detect the hazard and to devise the preventive measures.

In addition to the control of the environment, there must be personal protection afforded to the worker by various procedures which may be summarized as follows:

1. Physical examination of all workers before employment in order to supply hazardous departments with those best physically fitted for the work and in order to protect the sub-standard worker by employing him elsewhere in the factory.

2. Periodic reexamination of workers in departments in which there is an occupational disease hazard, giving special attention to the effects of any hazardous condition on the worker. Such examinations should be made as frequently as the type of hazard requires.

3. Periodic examination of the working conditions of the departments of the plant in which hazards exist.

4. Transfer to nonhazardous work of any worker showing signs of industrial disease.

Mechanical Control of Occupational Diseases

DAVID S. BEYER, *in National Safety News*, (August, 1933): —An analysis of approximately $300,000 in losses of one insurance company doing a general workmen's compensation and liability business, for recent industrial disease claims, showed 54% for cases involving pneumoconiosis, (including silicosis, asbestosis, etc.), 26% for lead poisoning, 9% for various forms of dermatitis, 5% for benzol, and the remaining 6% for scattering causes such as carbon monoxide, carbon tetra-chloride, chrome and chlorine.

In one section where there is a so-called "dusty" trade employing only about 2000 men on an annual basis, there have been 92 occupational disease claims during the latest available five-year period (68 of them for death or permanent total disability) with combined losses of nearly $300,000.

In some industries the cost of industrial disease is now four or five times that of all other industrial accidents combined. Many concerns that have serious occupational disease hazards extending over a period of years find themselves virtually uninsurable, because of the heavy liability for claims that has been built up as the result of past exposure.

In general, the most reliable way to correct a dust hazard is to install exhaust equipment that will capture the dust at the point where it is generated. This has been worked out very effectively for such equipment as grinding and buffing wheels.

In other operations, such as the shaking out of foundry castings, it may be possible to do this work at night, by men who are protected by respirators, and thus eliminate a common exposure to employees engaged in other operations in the same room. The use of enclosed mechanical conveyors and material handling systems, properly exhausted, instead of the old

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THE OBJECT of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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individual hand methods where the workers were brought into close contact with dusty substances, offers a solution in other cases.

Where the dusty work is in a permanent location, and too great freedom of movement is not required, the air-fed respirator may give satisfactory results. For cases of temporary dust exposure, as for sweeping and cleaning up dust, the improved types of filter respirators may be adequate. In some cases substitutes may be found for the substance causing the trouble. This has already been done in some processes where benzol was formerly used, and efforts are being made to extend the use of this principle.

Water has been found rather effective for laying the dust in some operations such as mining, sweeping up dusty floors, etc. In other cases, it has been a disappointment as, for example, on grinding wheels, where a dry exhaust system has proved to be more satisfactory than wet grinding.

An important point that should be borne in mind in designing an exhaust system is that it is highly desirable to capture the dusts or vapors as close to the point at which they are generated as possible, before they have had a chance to be diffused throughout the air of the room.

Where the exhaust equipment has been looked on in the past as more or less of a nuisance because it is nonproductive and could accordingly be slighted at will, it must now be recognized as a primary operating problem, and responsibility must be placed on someone to see that it is kept in first class condition at all times.

In installing such equipment it will save money and grief in the long run, to employ a competent engineer who understands the difficulties of collecting impalpable dusts or vapors, and can have a reasonable assurance of getting an effective installation without too much of the "cut and dry" method.

Respiratory Protection

WILLIAM P. YANT, *in National Safety News*, (August, 1933): —This paper describes what "permissible" means in respiratory protection, outlining the work of the Bureau of Mines in approving respiratory equipment and correlating the interests of manufacturer and consumer, in the provision of this type of equipment.

Arrangements have been made by the Bureau of Mines for the testing of various products, the manufacturer to pay a fee to cover the costs of the tests. If the device meets the requirements, the Bureau issues an approval to the manufacturer and places it on the list of approved devices, these lists being published periodically.

Submission of equipment is entirely voluntary on the part of the manufacturer. If he chooses to have the tests performed he makes a formal application and deposits the fee in the form of a check payable to the Treasury of the United States. None of the money accrues to the Bureau of Mines. If the application is accepted, the manufacturer supplies gratis the equipment required for the tests, this necessarily being a finished product identical with that to be placed on the market. The material is then subjected to all of the examinations and tests prescribed in the schedule for the particular kind of equipment.

When the device submitted meets all the requirements, a formal report of approval is made to the manufacturer. If it fails in any specification or test, the examination is immediately suspended and the manufacturer is informed, with a view to possible remedy of the defects. If the defects are remedied, the appliance may be resubmitted upon payment of such additional fees as may be teemed necessary to cover the cost incurred by the failure.

The report of approval is accompanied by a photograph of a design of the approval plate which the manufacturer must use in labeling the approved device. The purpose of the approval label is to provide purchasers and users with a means for identifying permissible devices. Also the manufacturer may thereby advertise the quality of his appliance. Permission to place the label on appliances obligates the manufacturer to maintain the quality of his product and see that each device in all its parts is constructed in accordance with the specification of the device that the Bureau has examined and approved. Any device that exhibits changes in design or includes any parts that were not in the device approved is not permissible and must not bear the Bureau of Mines approval label.

Performance requirements are based upon the study of the principles and construction of the apparatus, and performance tests which are described in detail.

The Bureau's observation of its work in this field has shown definitely that through the cooperation and interest of manufacturers the quality of respiratory protective devices has been constantly improving. The success of this approval system has been dependent to a very significant extent on the demand of the consumer for approved devices. This in turn has stimulated the manufacturer to seek approval. Appliances that have met the Bureau requirements are now specified in safety codes by municipalities, states and corporations. There is also the important feature of providing protection from criticism, if not liability, should injury occur to employees using the devices. It is alleged that a case has actually occurred in which

failure to provide approved equipment has been given consideration in awarding compensation.

New Fracture Treatment

DR. LEROY H. OETJEN, *in Journal of the Florida Medical Association*, (August, 1933):—At the outset the patient is given one-fourth gr. of morphine to make him comfortable and to render as painless as possible the few necessary manipulations incident to the application of the splint and cast. A preliminary x-ray should always be made to ascertain what type of fracture is present, and to determine if internal or external rotation, adduction or abduction will be necessary. If the patient is in a hospital, make use of the Hawley fracture table as this greatly facilitates the application of the cast and keeps the patient much more comfortable, although one does not even need to remove the patient from the stretcher on which he was carried to the x-ray room. After a thorough study of the preliminary x-ray, both lower limbs are washed and dried and all traces of dirt removed so as to prevent irritation within the cast. The first cast to be applied is upon the well leg and is applied in the usual manner, extending from the mid-thigh to several inches beyond the toes. The foot should be placed at right angles to the leg and should be held in slight eversion. Care should be taken that the plantar surface of the cast is firmly reinforced so as to support the weight of the counter traction. Roger Anderson advises that holes should be cut in the cast to relieve pressure on the malleoli. The splint is then unbolted into its three major parts and the counter traction stirrup is then incorporated in the cast by means of a few turns of plaster bandage. After this attention is directed to the fractured leg. The first procedure is the insertion of the Steinman pin. For this, use an ordinary sterile tray containing 2% procaine, ether, iodine, alcohol for the skin preparation, 10 cc. Luer syringe and needle, Steinman pin and handle, sterile sponges, gloves, and towels. The ankle of the fractured leg is then prepared and draped in the usual manner. The site of election for insertion of the Steinman pin is at a point two fingers' breadth above the internal malleolus. The skin and periosteum on each side is infiltrated with 2% novocaine and the pin is inserted without any drilling or preliminary skin incision. Sterile sponges are then placed next to the skin over the ends of the pin. This procedure is absolutely painless and one should not hesitate to place the pin in position qoickly. The leg is then wrapped with cotton batting and the plaster cast applied including the toes and several inches beyond. The traction stirrup is then placed over the ends of the pin and the stirrup incorporated in the cast with a few turns of plaster bandage. After the plaster has firmly set the splint is then bolted together and the traction nut screwed down and correct alignment of the fragments obtained by either internal or external rotation of the fractured leg. It is well to remember that sufficient traction has been exerted when the lever arm is drawn down to a right angle to the longitudinal axis of the leg.

It is a good plan to recheck the x-ray findings on the next day so as to ascertain if more or less traction is required and if the proper degree of rotation has been secured. As to time

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This preparation contains 2% Mercurochrome in aqueous-alcohol-acetone solution and has the advantages that:

Application is not painful.
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Literature on request

HYNSON, WESTCOTT & DUNNING, INC.
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Better Control of Industrial Dust Diseases is now possible

With accurate knowledge of the true danger of any dusty job or operation, it is only necessary to select a respiratory device that has been correctly designed for the type of protection needed and whose merit and good construction have previously been conclusively demonstrated. . . . That our policy and products are right is indicated by the gratifying experiences of customers who have operations involving serious hazards. . . . It is not possible to gauge the protective ability of respirators by appearance; we are glad to lend our experience to industrial physicians in preparing recommendations for unsafe conditions.

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of removal of pin, Anderson states: "The time of removal of the pin depends upon such factors as the age of the patient, the location and type of fracture and callus formation. In general the following schedule is adhered to: fractures of pelvis, four to six weeks; fractures of neck of femur, 12 to 14 weeks; intertrochanteric fractures, seven to nine weeks; subtrochanteric fractures, seven to 10 weeks; fractures of femoral shaft, five to 10 weeks; fractures of distal third, five to 10 weeks; fractured tibia, four to 12 weeks; operative cases, six to 18 weeks. After the patient has been removed to his home and x-ray pictures are no longer easily obtained it is a good plan to frequently check the leg for shortening or lengthening as the case may be. This measurement is made from the anterior superior spine to the internal malleolus, and is done after the openings are made in the casts.

Types of Medical Practice

DR. JOHN McCOMBE, *in International Journal of Medicine and Surgery,* (July, 1933):—The author discusses three phases of medical endeavor as it relates to mercantile and industrial medicine in general.

The first is the field of private practice where the welfare of the individual patient is all important. Whether medical attention be given by a general practitioner, by a surgeon or other specialist, or by a combination of doctors, the cure of disease or injury is the chief and usually the sole objective. Yet even within this sphere of remedial medicine the care of the individual expands into the protection of the community, for the physician is of necessity interested in the prevention of infectious disease, and the general practitioner is frequently called upon to act as a health officer.

The second is the field of mercantile and industrial medicine, where occupational groups of people are collected for work in office, warehouse, mill and factory. Here, although the welfare of the individual still retains its full importance, it is modified by the necessity for safeguarding fellow employees from danger and the employer from financial loss on account of disease or other physical disability exhibited by any member of the working force. The protective function of the industrial doctor is greatly enhanced by what have become the accepted methods of his practice. He is free to make systematic physical examinations, by which unsuspected or latent disease is detected at a time when medical guidance may be completely successful. He is in a position to treat accidental injuries immediately and thereby to lessen their severity, to prevent infection, and to reduce the loss of working time to a minimum. He can investigate personally and check frequently the recurrence of occupational disease. In the sphere of hygiene and preventive medicine he is in a much better position than the general practitioner, for he is a technical adviser on sanitary questions and the accepted health officer of the plant. If he is tactful he can secure the entire confidence of the employees, as well as that of the management, to the great benefit of both and to his own peace of mind. Each employee will be treated as an individual human being to whom is due the best possible advice concerning his physical condition, and it will be found that the protection of fellow workers and the interests of the employer will not diminish but increase the preservation of his health.

The third field is that which was opened to medical endeavor by the development of transportation. Added to the problems of industrial medicine, in which groups of employees are stationary in one locality, are those of working forces that must go from place to place in performing the functions of the common carrier. Safety of movement depends to a considerable extent upon the physical condition of these employees, and this at once introduces a new and dominant factor, which is the safety of the traveling public.

As Winter proceeds

. . . the physician is called upon to contend with innumerable cases of

ACUTE RESPIRATORY DISEASES

In the management of

SIMPLE COLD · INFLUENZA · BRONCHITIS

and in chest conditions, as pneumonia, Antiphlogistine is an effective and suitable method of treatment.

The physiological action of Antiphlogistine on inflammatory areas is that of hyperaemia, which acts as a decongestant, an analgesic and corrective agent, promoting elimination of the toxic products and an improvement in the clinical picture.

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Sample and literature on request

THE DENVER CHEMICAL MANUFACTURING COMPANY

163 Varick Street, New York

Noise and Hearing

DR. C. C. SWANN, *in International Journal of Medicine and Surgery*, (July, 1933) — Observations by Boval on railroad employees show that deafness among engineers and firemen increases with age and years in the service; in the beginning the healthier the organ of hearing and the greater the power of resistance of the organism, the less harmful is the effect of noise. If, after a short time in the service, a man comes in complaining of giddiness and nausea, and examination reveals a deficiency in hearing, we are led to believe that the circulation through the brain has been affected, and that a hypersensibility of the cochlea has resulted from the constant din and vibrations of

the locomotive. These phenomena are mostly observed in the early career of the worker; they are diminished when the sensibiilty of the ear to the persistent sound is decreased. A patient presenting the above symptoms should be warned of the possible necessity of changing his occupation, and should be kept under observation, with examinations at frequent intervals. In early involvement hearing tests will reveal a diminished acuity for sounds of high pitch; and rapid diminution in the perception of high tones should lead us to advise a change to some other line of duty.

The engine worker, exposed to rapid variations of heated and cold air, laden with coal dust, is readily susceptible to inflammation induced in the mucous membranes of the nose and nasopharynx. Secondary affection of the ear rapidly follows and consists of a non-suppurative thickening of the soft tissues of the middle ear, or a suppurative process which may be rapidly destructive in its course. When in addition there is the loud noise of the locomotive, associated with the constant vibration, the cycle of injurious effects is complete, and a high degree of deafness may ensue. With the advent of oil-burning locomotives and electrified railroads we may expect a rapid disappearance of this affection among our workers.

There is little doubt that vibration does play a part in producing the deafness, and it seems reasonable that a possible benefit would be derived from having engine workers wear rubber or cork soles or felt shoes, and in front of the seat box could be placed a rubber or felt mat to prevent contact with the floor. An ideal arrangement would be the construction of the cab floor on a special mechanism to eliminate vibration.

A careful history from all applicants, with a thorough examination by a competent otologist is essential before accepting a man for locomotive work. Early recognition of symptoms referable to middle or inner involvement, and observation relative to a rapid progress, with subsequent advise to a change of occupation is essential to the future welfare and competency of the worker. Any applicant presenting physical defects or pathologic changes in the structures of the nose, throat or sinuses should be required to have these corrected or eliminated before being accepted.

Industrial Physicians & Surgeons

Department of Personal Mention

DR. C. F. N. SCHRAM, since June, 1917, head of the medical Department of Fairbanks, Morse & Company, at Beloit, Wis., resigned on February 6 to take a similar position with the Tennessee Eastman Corporation, a subsidiary of the Eastman Kodak Company, at Kingsport, Tenn. There, at Kingsport, a city of 16,000 in the Shenandoah mountains, four miles from the Virginia line, which has been built entirely since 1918, Dr. Schram will have direction of the medical and surgical care of 3,000 employees and will be in charge of a new plant hospital which will be opened on June 1. The Tennessee Eastman Corporation has 40,000 acres of timber and produces wood alcohol, acetone and other chemicals used by the Eastman Kodak Company. It also manufactures chemical and wood by-products.

C. F. N. SCHRAM, M.D.

Dr. Schram went to Beloit in June, 1917, as head of the medical department of Fairbanks, Morse & Company. He instituted a comprehensive program of health and hospital care and developed a shop hospital that received the approved rating of the American College of Surgeons. He has wide contacts in the field of industrial medicine; in 1928 he was president of the American Association of Industrial Physicians and Surgeons, and is now a member of the governing board of that association. He was active in effort to establish a municipal hospital at Beloit?; is secretary of the Rock County Medical Society; is a past president of the Beloit Physicians' and Surgeons' Club.

During his residence in Beloit, Dr. Schram was interested in many civic and public movements. He has for the last 10 years been secretary of the Izaak Walton League and a leader in the conservation program of that organization. He also has been one of the leading laymen in the Methodist Episcopal church and a member of the official board of the Beloit church.

DR. RAYMOND F. BALDWIN, of Beloit, Wis., has been named to succeed Dr. C. F. N. Schram as head of the medical department at Fairbanks, Morse & Co., at Beloit. He is a graduate of Beloit high school, the University of Wisconsin medical school, and has been physician in the university athletic department and at the state hospital for crippled children at Madison.

WALTER B. PITKIN, in the pages between the dedication and the table of contents of his new book "MORE POWER TO YOU," (Simon and Schuster, Inc., 386 Fourth Ave., New York) makes gracious acknowledgements to "many investigators of human energies." In part he says: "So far as I know, no one has made a more comprehensive study of the factors affecting energy and working ability of factory employees than Dr. Carey McCord and his assistants, of the Cincinnati Industrial Health Conservancy Laboratories."

JANUARY'S "Who's Who in I. M. & S." of which Dr. Volney S. Cheney, Medical Director, Armour and Company, was the subject, mentioned "Shefske" as among the group of industrial M.D.'s who in 1916 at Detroit organized the American Association of Industrial Physicians and Surgeons. Dr. A. M. Harvey, Crane Co., Chicago, writes that this should have been "Schereschewsky." Dr. Schereschewsky, specialist in industrial hy-

giene and occupational diseases, was the first President of the American Association of Industrial Physicians and Surgeons. He was born at Peking, China, in 1873; was Acting Hospital Steward, U.S.A., in Cuba, in 1898; was appointed Assistant Surgeon, U.S.P.H.S. in 1899, Surgeon in 1912. He was in charge of the Office of Field Investigation of Occupational Diseases, U.S.P.H.S., 1913-18; Assistant Surgeon General in charge of the Division of Scientific Research, Bureau of Public Health Service, 1918-22; and was later in charge of investigations in cancer for the Public Health Service.

Industrial Medicine News

Accidents Reduced

GOVERNMENTAL figures relating to various industries show that the accident experience in a number of groups was substantially reduced during 1932. Referring particularly to the iron and steel industry, there has been a decline from 82.08 accidents resulting in death or disability per million man-hours worked in 1907 to 18.06 in 1932. In 1907, 6.9 hours of working time was being lost by injured workmen for every thousand man-hours worked. In 1932 the loss of time was 2.19 hours. This is a reduction of 68.3%. The fatal accident rate diminished from 0.76% in 1907 to 0.14% in 1932, permanent disability from 1.27% to 1.03%, and temporary disability from 80.03% to 16.89%.

The best records are those of blast furnaces, Bessemer converters, plate mills, open hearth furnaces and rolling mills.

The poorest are those of foundries, puddling mills, and axle and car wheel works. In fact, the frequency rate in puddling mills increased from 47.07 in 1917 to 68.94 in 1932. Taking the four leading iron and steel manufacturing states, Pennsylvania, Ohio, Indiana and Illinois, Indiana has considerably the best record. In Indiana the rate was lowest in 1907, and the percentage of improvement was greater in 1932 than that of any of the other three states.

In the petroleum industry the last six years have witnessed a reduction in the accident frequency rate of 70% and in the severity rate of 28%. With an estimated cost to this industry of $300 for each disabling accident, this reduction represents a saving of more than $3,000,000 in 1932. In the cement manufacturing industry the frequency rate fell from 10.61 in 1928 to 4.65 in 1932, and the severity rate fell from 3.72 to 1.80; of the 112 cement manufacturing establishments 57 reported that they had had no disabling accidents in 1932, and 30 others had but one accident each.

The development of industrial safety codes which, since 1913, has been a function of the United States Bureau of Standards, has been transferred as a government economy measure to the American Standards Association. This association, organized in 1918 by five major engineering societies, is a federation of 37 trade associations, technical societies and governmental departments.—*J. A. M. A.*, (December, 1933).

Lead in Canned Sardines

THE REGULAR London Correspondent of the American Medical Association refers to a problem regarding this subject.

At the Society of Public Analysts, Dr. L. H. Lempitt and a collaborator read a paper reporting that canned sardines had been found seriously contaminated with lead. An apparent connection existed between the amount of solder exposed in the can and the lead content of the sardines. But solder was not the only source of lead, for it had been found in sardines packed in cans in which no lead could be derived from the container. It had been shown that sardines cooked on grills covered with so-called tin containing appreciable quantities of lead were badly contaminated with the latter, whereas if pure tin was used the lead content of the sardines fell to a negligible figure. The metal of the grills was the chief source of contamination with lead. The lead content of sardines should not be substantially more than from five to eight parts per million. Higher figures indicated avoidable contamination in the preparation of the sardines before canning. —*J. A. M. A.* (January, 1934).

Compensation in Czechoslovakia

A SECTION for the study of industrial hygiene was organized recently within the Association of Czech Physicians. The impetus came from the need in medical practice resulting from the law on compensation for industrial diseases. When the law became effective in 1933, a list of 25 occupational diseases was made up that come under the workmen's compensation act. The sickness insurance bodies notify cases of these diseases when they last longer than 26 weeks, and if the claimant is disabled a pension is given in proportion to his reduced working capacity. Since this measure affects the financial interest of sickness insurance bodies, they search among their patients for cases that can be proposed for a pension. Up to the present, the occupational side of the etiology of diseases has been somewhat neglected. The new law makes necessary the definition of clinical symptoms that make up a compensable case of industrial disease. The first session, which was recently held, heard papers on lead poisoning, the organization of first aid in large factories, and the relation of silicosis to tuberculosis. The group represents not only the Prague Faculty of Medicine, but also leading physicians of provincial hospitals and medical departments of important industrial corporations. —December Letter of the Prague Correspondent of the A. M. A., *J. A. M. A.* (January, 1934).

Asphyxial Death

THE SECOND annual conference of the Society for Prevention of Asphyxial Death was held at the Hotel Biltmore, February 19-20. The subject was approached from three angles; research, instruction and practice. Among the speakers were Dr. Chevalier Jackson, Philadelphia; Dr. Harrison S. Martland, Newark, N. J.; Dr. Royd R. Sayers of the U. S. Public Health Service, Washington, D. C.; Dr. Leon A. Fox of the U. S. Army Medical Corps; Dr. Ernest W. Brown of the U. S. Navy; Drs. Pol N. Coryllos, Charles Norris, Hendy Hall Forbes, James J. Walsh and Horatio B. Williams. At an evening session Dr. Wendel C. Phillips, former president of the American Medical Association, discussed asphyxia as a problem of medical education, and Col. F. L. Devereux demonstrated the use of sound pictures as a teaching medium. A dinner was held the second evening in memory of the late Dr. Joseph O'-Dwyer, who has been called a pioneer in this field. There were scientific

and technical exhibits dealing with prevention of asphyxial deaths. Among the exhibitors in the former were Dr. Martland, who showed charts, graphs, models, photographs, gross and microscopic pathologic specimens; Alexander O. Gettler, Ph.D., chief city toxicologist of New York, the chloride test for submersion and chemical determination of carbon monoxide poisoning; the American Telephone and Telegraph Company, work undertaken by this firm on electrical shock; Yale University, New York Post-Graduate Hospital and other groups.

The Nose and Dust

A NEW TEST regarding the capacity of the nose to collect dust has been the subject of research in Berlin. Dr. Gunther Lehmann, Emperor William Institute for the Psysiology of Work, has developed a method to determine what percentage of the inspired dust can be retained by the nose. With this method, dust-laden air is blown into the nose, and the air, while the breath is being held, emerges from the mouth. By means of two konometers, the concentration of the dust is measured before it enters the nose and after it emerges from the mouth. It was found that many noses retain up to 75% of the inspired dust, whereas others allow virtually all the dust to pass out. The concentration of the dust plays a small part; likewise the velocity of the air in motion, and the chemical nature of the dust. The observations made it seem that persons with poor dust fixation capacity of the nose are particularly disposed to pneumoconiosis. Therefore, 89 stone cutters who had worked in stone from 10 to 30 years were examined. Of this number 53 were healthy, while 36 had pneumoconiosis. The dust fixation capacity of the healthy workmen averaged about 52.3% while the average of the workmen with pneumoconiosis was about 22.3%. Of the 46 stone cutters with a dust fixation capacity above 40%, only two presented pneumoconiosis, while 44 were exempt. Of the stone cutters with a dust fixation between 29 and 40%, five were ill and five were healthy, while two were showing just the first symptoms of disease. Of the 31 stone cutters with a dust fixation capacity under 29%, only two were healthy, while all the others were affected with pneumoconiosis. A good dust fixation capacity of the nose affords, therefore, almost complete protection against pneumoconiosis, whereas persons with poor dust fixation capacity, under corresponding conditions, are almost certain to develop pneumoconiosis. Applicants for work as stone cutters should be given this test, and those with poor dust fixation capacity should not be allowed to work where a menace of silicosis exists.—From *December Letter,* Berlin Correspondent of the A. M. A.

Silicosis and Other Dust Diseases

THE INTERNATIONAL Labour Office has published (1933), as "Report V" to the Eighteenth Session of the International Labour Conference, Geneva, 1934, a pamphlet of 328 pages, entitled "Workmen's Compensation for Occupational Diseases." The last two of the four parts into which this report is divided discuss silicosis and other pneumoconioses in relation to compensability and summarize existing silicosis legislation.

Among other papers of recent date on this subject the following are particularly instructive:

"Review of Silicosis—Part VI," by Adelaide Ross Smith, M.D., *The Industrial Bulletin* (N.Y.), Nov., '33.

Accept this offer, Doctor . .

Indications of headache, sour stomach, indigestion, gas, and other digestive disturbances, reduce the efficiency of employees in industrial plants. For more than 45 years

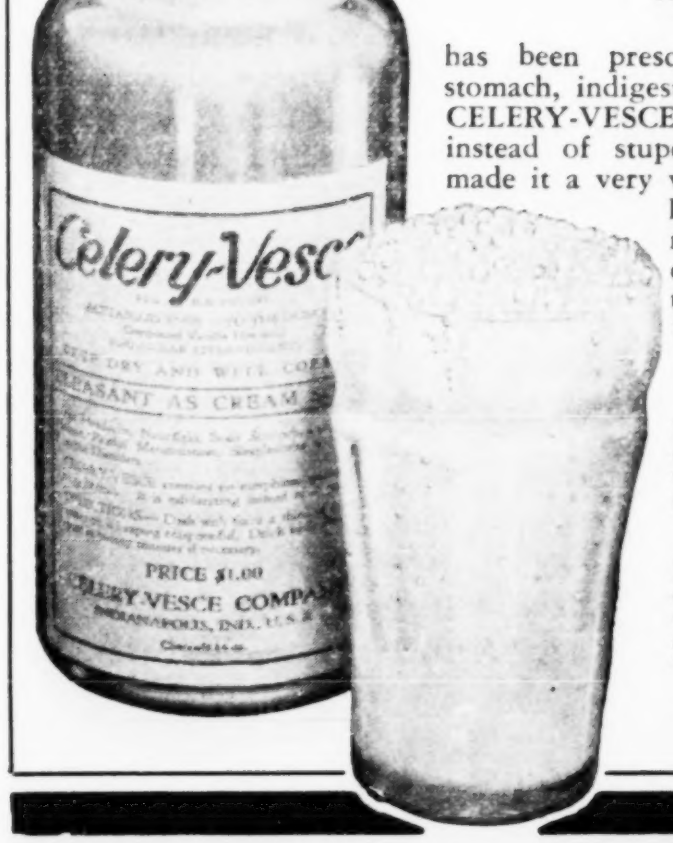
Celery-Vesce REG. U.S. PAT. OFF.

NRA MEMBER U.S. WE DO OUR PART

Acetanilid 12 Gr.—to the ounce—Compound Vanilla Flavoring
(Granular Effervescent)

has been prescribed and dispensed by physicians for the relief of headaches, sour stomach, indigestion and other digestive disturbances.

CELERY-VESCE contains no morphine, opium, antipyrine, or bromo. It is exhilarating instead of stupefying. While it is effervescent it has a truly pleasant flavor that has made it a very welcome item in the Medical Department of industrial plants.



Physicians in industrial plants may prescribe for their employees CELERY-VESCE — available through retail drug channels in 10c, 25c, 50c, and $1.00 sizes.

Dosage

Heaping teaspoonful, place in glass, dash with force a third of a glass of water. Drink while foaming. Repeat in 20 minutes if necessary.

If you, Doctor, have never dispensed or prescribed CELERY-VESCE, we will be glad to send you, postpaid, an original $1.00 pkg. upon receipt of 50c. We will also send you

25 Sample Packages Free

Send Coupon NOW!

CELERY-VESCE COMPANY,
Indianapolis, Ind. Dept. I

I enclose 50c for which please send me a regular $1.00 bottle.
Send me free 25 sample pkgs. also.

Dr.....

Address.....

City & State.....

"Silicosis in Rochester," by Dr. William S. McCann, of the University of Rochester, *Bulletin of The Self Insurers Association* (N.Y.), Jan. 2, '34.

"Pulmonary Asbestosis," *Monthly Labor Review*, December, 1933.

Report of Conference Committee of Five of the New York Compensation Insurance Rating Board—"In re Occupational Diseases," Jan. 11, '34.

NRA Survey

NATIONAL Industrial Conference Board, summarizing the results of its latest survey, says: "Two definite conclusions may be drawn. In the first place, it is clear that individual bargaining has not in any way been eliminated by Section 7(a) of the Recovery Act. There are too many companies in which this method has proved satisfactory over a long period of years to permit of its elimination. Many of these companies, moreover, are not of sufficient size to call for a representation plan. It seems likely, therefore, that individual dealing will remain the basis of employer-employee relations in a majority of industrial establishments, especially since a large proportion of such establishments is in the small-size class.

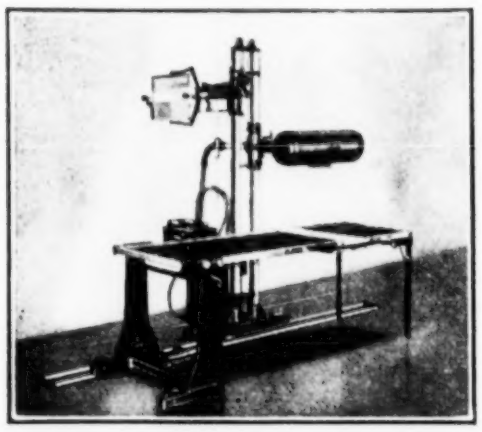
"The second general conclusion is that employee-representation plans have expanded greatly, both in number of companies affected and, particularly, in number of employees covered."

Write for Detailed Information

About: (and mention *Industrial Medicine*) To:

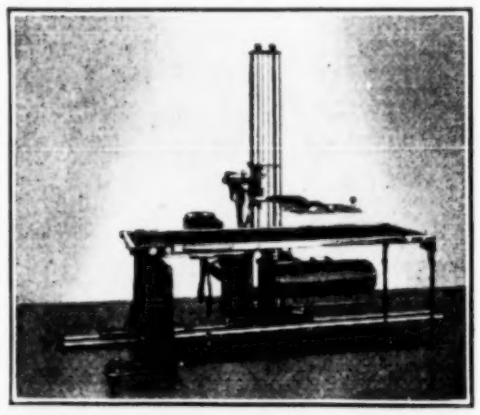
The Items and Things Herein Described	The Manufacturer Whose Name and Address Are Given

H. G. FISCHER & CO., Inc., x-ray and electro surgical and medical equipment, 2323-2327 Wabansia Ave., Chicago, Ill., describe their advance in diagnostic x-ray apparatus —especially intended for physicians who have felt the need of a diagnostic x-ray unit for both radiography and fluoroscopy, but who have hesitated, for various economic reasons, to have the same installed.



Positions Fig. 1 (left) Horizontal Radiography

Fig. 2 (right) Horizontal Fluoroscopy



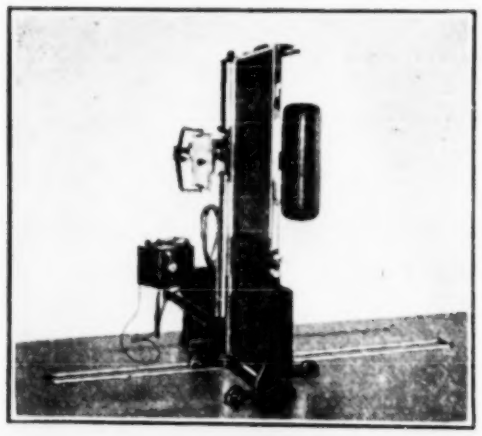
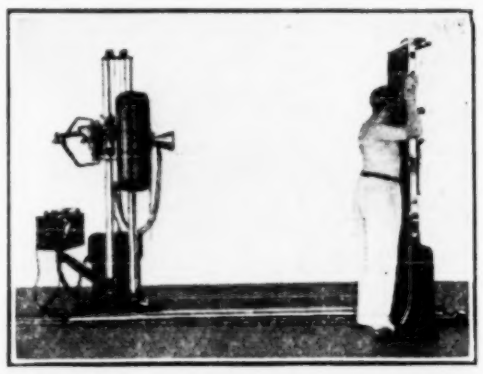


Fig. 3 (left) Vertical Fluoroscopy

Fig. 4 (right) Vertical Radiography



"What formerly required four distinct pieces of apparatus has now been combined into one complete unit capable of giving both horizontal and vertical radiography and horizontal and vertical fluoroscopy. The illustrations show the various positions which the apparatus readily assumes by simple, almost instant, adjustment.

"This new unit also is completely shock-proof, when properly grounded, and noiseless in operation. There is no crackling or sputtering to frighten patients, with resultant loss of detail in the radiographs. The instrument generates 60 milliamperes at 88 K.V.P., which will produce excellent radiographs of heart and lungs at a six-foot distance; stomach or colon with barium meal in a fraction of a second, etc. There is a tilt-table, built-in Bucky diaphragm, foot switch, tube and x-ray timer. The complete outfit, owing to the simplicity of design and modern manufacturing economies, sells for a surprisingly low figure without accessories."

G. D. SEARLE & CO., "Fine Pharmaceuticals," 4737-4743 Ravenswood Ave., Chicago, Ill., announce a shockless protein therapy: "Industrial surgeons have long known the prophylatic protection of nonspecific protein therapy in accidental wounds, cuts, abrasions, etc — especially those involving the eye.

"The objections to this type of treatment have been, in the past, that the resulting chill, fever, and malaise, have too often laid up the patient, causing a loss of effective working time, and that the patients have complained of stiffness and soreness at the site of injection.

"Now the protein of milk has been scientifically prepared so as to permit all of the beneficial stimulant to the bodily defensive mechanism—the production of leukocytes, increase of macrocytic activity, and the stimulation of antibodies have been accomplished without the concomitant systemic anaphylatic shock. A shockless protein called PROTEOLAC is injected as painlessly as distilled water, and with as little unpleasant reaction. On the other hand, in several thousand cases the material increase in the defensive mechanism has been demonstrated and reported."

LEHN & FINK, INC., a division of Lehn & Fink Products Company, Professional Department, Bloomfield, N. J., writes: "We have developed and are just beginning to introduce professionally and ethically, that is, to the medical profession, dentists, and nurses, an antiseptic and germicide which goes under the name of AMPHYL and is a combination of alkyl and halogen phenol derivatives of synthetic origin, bacteriologically standardized. It is entirely free from irritant or toxic properties, practically odorless, and economical to use inasmuch as it is to be diluted and used in solutions from ½ to 2%. It does not affect instruments, rubber goods, or fabric. It is potent against not one class but all classes of bacteria generally, including pathogenic fungi, and the low surface tension of its solutions

assures its power to spread and penetrate deeply. Clinical evidence which has been collected from a considerable number of tests made indicate that it is effective in the treatment of wounds, etc., without, so far as we know, any handicaps."

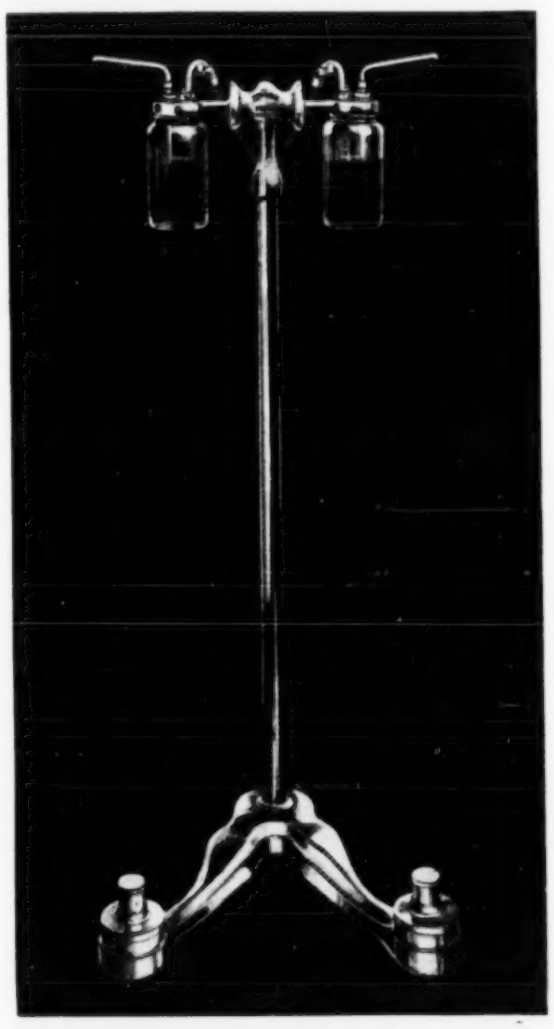
DAVOL RUBBER COMPANY, Providence, R.I., has the new No. 50 DAVOL CONCAVE HOT WATER BOTTLE, which because of its concave surfaces does not bulge out of shape; fits the body comfortably and stays in place, providing more contact area than the ordinary style bottle; has the special, patented, rough inside surface

Davol Concave Hot Water Bottle

which prevents the sides from sticking together; and when filled is about one-fourth lighter in weight than other bottles with the same surface area.

LINDE AIR PRODUCTS COMPANY, unit of Union Carbide and Carbon Corporation, 1201 Bartholomew Building, 205 East 42nd St., New York, N. Y., writes: "We have been taking a very active interest in the subject of oxygen therapy, that is the administering of high concentrations of oxygen in the treatment of various diseases. However, our direct interest in this subject is confined to the manufacture and sale of Linde Oxygen U. S. P. and Linde Type R-51 Oxygen Regulators. While we do not manufacture oxygen therapy apparatus other than the above mentioned R-51 Regulator, our many years' experience in handling oxygen enables us to offer suggestions to the medical profession in connection with the mechanics of oxygen therapy. We have available a complete set of the literature on the subject of oxygen therapy. Some of this literature has to do only with Linde Oxygen U. S. P., some of it treats the subject from a mechanical point of view only, and the remainder is a series of reprints of papers written by the leading medical investigators in the field of oxygen therapy. It is our feeling that one of the main factors contributing to the increasingly widespread use of oxygen therapy in the treatment of diseases is the fact that The Linde Air Products Company has made available to the medical profession large quantities of high purity oxygen in industrial size cylinders at commercial prices, and that this oxygen is available almost anywhere in the country."

VESTAL CHEMICAL LABORATORIES, INC., 4963 Manchester Ave., St. Louis, Mo., makes the SEPTISOL SURGEONS SOAP AND DISPENSERS, the latter (illustrated on this page)



Vestal Dispenser

being foot-operated. The DISPENSERS are furnished in the double-portable, single-portable and wall-type models, and all metal parts are chromium-plated.

THE CUTTER LABORATORY, Fourth and Parker Sts., Berkeley, Calif., is introducing two products:

(1) SAFTI-FLASK SOLUTIONS — solutions of glucose, physiological saline, etc., diluted and ready to use in the surgery, in a novel type of container of particular interest to industrial physicians without immediate modern hospital facilities (although Safti-Flask Solutions are already in use in large hospitals in the west); and

(2) TOXOK CONCENTRATE—a concentrated extract of poison oak in absolute alcohol, supplied with diluent for diluting immediately before injection—this, with the ordinary diluted Toxok in syringe form, being used by industrial concerns which have contact with poison oak as an incident of their operations.

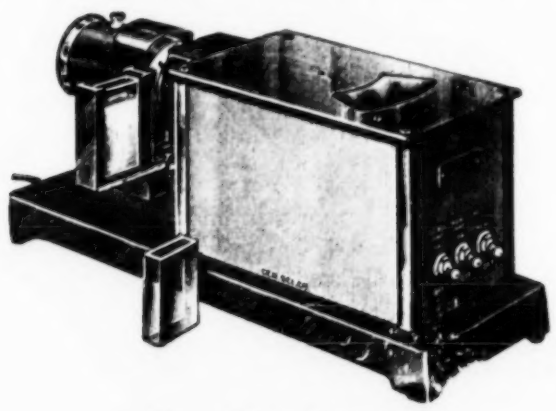
CENTRAL SCIENTIFIC COMPANY, scientific instruments and laboratory apparatus, 460 East Ohio St., Chicago, Ill., has:

1. The THERMELOMETER—a sensitive, rapid-responding electrical clinical thermometer, designed for use in hyperpyrexia where the slow mercurial

The Thermelometer

clinical thermometers are of no value; its design influenced to the minimum extent by high frequency currents used in electropyrexia.

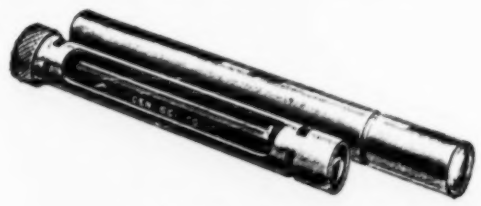
2. The PHOTELOMETER — an analytical device which accurately indicates, after but a few seconds of simple manipulation, the quantity of a



The Photelometer

substance sought; invaluable in the laboratory where large numbers of similar determinations are made.

3. The DOSIMETER — in effect an artificial highly sensitive human skin in its responses to the action of ultra violet radiation, used to indicate the



The Dosimeter

time of exposure of human skin to any particular source of ultra violet radiation to produce a minimum perceptible erythema, thereby protecting from sunburn.

These devices have special interest for physicians connected with clinics where facilities for hyperpyrexia, lab-

oratory analysis or light therapy are available. Not many individual physicians find it economically possible to equip completely for such work. "The treatment of certain infectious diseases by hyperpyrexia is the direct reverse of older medical practices, where every effort was made to reduce fevers. The new technique is to develop a fever as high as safety will permit, to kill bacteria in the patient's system by heat sterilization. The remarkable results secured, especially with the so-called incurable infectious diseases, make this therapy of unusual interest. It is safe and effective, however, only when carefully controlled by proper facilities and experienced workers."

H. CARSTENS MFG. CO., 565-7 West Lake St., Chicago, Ill., has the "Carstens Modernized Ford Stethoscope," with a combination soft

Carstens Stethoscope

rubber Y and bell, the latter readily adapting itself to curved surfaces.

FREDERICK STEARNS & COMPANY, Detroit, Mich., call attention particularly to Neo-Synephrin Hydrochloride Products for use in the treatment of colds or any congested condition of the nasopharnynx. New-Synephrin is being accepted by physicians throughout the country as a close approach to the ideal vasoconstrictor for use in the nose.

HEIDBRINK COMPANY, 2633 4th Avenue, South, Minneapolis, Minn., "gas anesthesia apparatus and dental and surgical specialties," recently placed on the market a portable oxygen tent. Heretofore oxygen tents have been bulky and unwieldy, and while they were ideal for institutional use they did not lend themselves readily to transportation and were usually too expensive for the average industrial hospital or emergency room. "In any industry where the workers are subjected to fumes of one kind or another there is always the possibility of respiratory difficulties. An oxygen tent is ideal for such treatment. The Heidbrink portable tent was built for emergency service. It is so small and light that it can be carried by a man of average physique, and it will go into the tonneau of an ordinary automobile. It is ideal for airplane transportation. With all of its compactness the hood or enclosure for the patient is just as large as on the big hospital outfit. The apparatus is motorless and can be used in places where current is not available. In addition, it has been priced considerably lower than the larger outfits."

MILBURN COMPANY, Free Press Building, Detroit, Mich., specializes in the problems presented by the many types of skin infections resulting from uses of oils, chemicals, acids and all other materials that cause skin eruptions and disturbances in the general and special operations of industry. Its research work is aimed at the development of products for the prevention of these infections, eruptions and disturbances, without claiming any therapeutical value for the products themselves. This work has already met with considerable success in connection with the "dermatological problems" of a number of companies.

Milburn Company offers to cooperate with physicians in industry to the fullest extent—not only toward the result of present cure, but also, and more important from the standpoint of the economics of industrial medicine, toward the ultimate result of future prevention. It specializes in this type of work, confines itself to this and nothing else.

EDWARD WECK & SON, Inc., 135 Johnson St., Brooklyn, N.Y., say: "For smaller bandages use" their "Handy Light-Weight Scissors" the WECK-KNOWLES scissors, "designed by a surgeon for surgeons."

RIGGS OPTICAL COMPANY, Merchandise Mart, Chicago, Ill., calls attention to a new apparatus manufactured by Bausch & Lomb Optical Company, Rochester, N.Y., for the purpose of measuring central and para-central fields for both white and color—field taking being an increasingly important part of industrial ophthalmology.

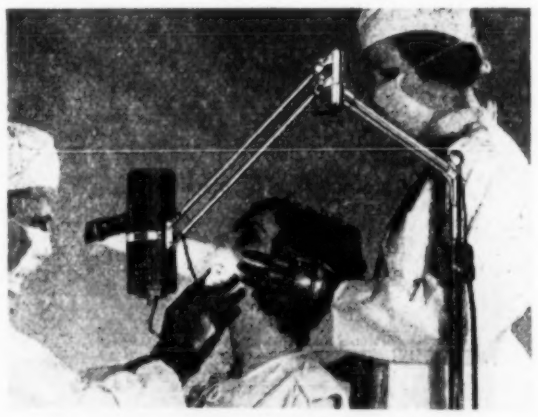
E. R. SQUIBB & SONS, New York, "manufacturing chemists to the medical profession since 1858," send the *Squibb Professional Notes* which is descriptive of some of the newer vitamin products of Squibb. Currently it calls attention to Squibb Autolyzed Liver Concentrate, a product only recently released and of value in treating anemia. It is potent, and "over a year's treatment of the average case of pernicious anemia, the cost may be as low as 10¢ per day."

JOHNSON & JOHNSON, New Brunswick, N. J., have "a product which undoubtedly is of interest to physicians and surgeons in industry. This product is DRYBAK adhesive plaster, a revolutionary step in the production of adhesive plaster.

"Drybak Adhesive Plaster has nine exclusive features:

1. Waterproof.
2. Glazed surface keeps clean.
3. Suntan color-less visible.
4. Greater tensil strength.
5. Sticks quicker, tighter, longer.
6. Easier to unroll.
7. Easier to tear off.
8. No curled-up edges.
9. Costs no more than old style adhesive."

BARKMEYER ELECTRICAL LABORATORY, 549 Washington Boul., Chicago, Ill., makes the Luxmore Operating Light — flexible, because, through the use of a revolving mirror, the light is reflected at a 45° angle from the source, enabling



Luxmore Operating Light

the operator to view the operating area from any angle and still be directly behind the light source. The lamp bracket may be raised or lowered by the touch of the finger, and it will remain in the desired position without any adjustments; the lamp housing also revolves in the swivel ring.

LA MOTTE CHEMICAL PRODUCTS COMPANY, McCormick Building, Baltimore, Md., "specializing in the development of test and control equipment and materials for the scientific and technical fields," suggest that readers of *Industrial Medicine* might be interested in some of their simpli-

fied blood chemistry units, described in the LaMotte Blood Chemistry Handbook. A number of industrial firms having clinics "employ these simplified tests to great advantage. In the first place they require a minimum of time; and they are portable, compact in form, and contain everything needed for the test. They may be carried to the bedside, or used in the laboratory or office."

McCASKEY REGISTER COMPANY, Professional Division, Alliance, Ohio, has a very attractive illustrated presentation of its "McCaskey System" for physicians. This has already made its appeal to numerous physicians and surgeons in industry.

Clinical and financial records which are *complete, permanent, detailed, accurate, careful and timely,* are highly important in any case; above all *tremendously* important in industrial medicine.

This tremendous importance is well realized in the "McCaskey System"; the illustrated presentation will be mailed on request.

CLIMAX RUBBER COMPANY, 1350 Broadway, New York, enclose a reprint from the *Journal of Biological Chemistry* concerning their new rubber which neutralizes body acids and is antiseptic. This is made under the name HEALTH-GARD. They say: "While doing the research work necessary in evolving this, we have contributed substantially to the medical profession by proving that the change of urine and perspiration, in the process of ageing, from acid to an alkali is not a chemical but a bacteriological change. This fact will have a far reaching effect in connection with skin diseases."

The HEALTH-GARD hospital sheeting which is antiseptic and anti-acid, has been approved by a large number of doctors; much cooperative work was done in connection with it by the Bellevue Hospital as well as the Administration of the City of New York. Special types of sheeting have been evolved for the Neurological Dept., as well as a special sheeting for the Tuberculosis Dept., and a special oil proof sheeting for certain departments where oil is used extensively.

This company is also manufacturing antiseptic surgeons aprons, and various other hospital supplies where the antiseptic phase is necessary.

New Books

WILLIAM WOOD & COMPANY, a division of The Williams & Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Md., have the following, of rather special interest to physicians and surgeons in industry:

ACCIDENTS, NEUROSES AND COMPENSATION, by James H. Huddleson (Associate in Neurology, Columbia University.) "Planned to show the surgeon of psychopathologist, in or out of industry, what these neuroses mean and how to circumvent them; if already established, the available avenues of approach and the practical methods of attack." *Cloth. 6x9. 234 pp. Bibliography. $4.00.*

THE INJURED WORKMAN, by G. F. Walker, M.D., M.R.C.P. with the collaboration of J. Harvey Robson, Barrister-at-Law (Law); R. E. Jowett, M.D., F.R.C.S. (Ear, Nose and Throat Surgery), Stanley Ritson, M.B., F.R.C.S. (General Surgery), and John Foster, M.B., F.R.C.S. "Contains much valuable information for American physicians and lawyers involved in compensation cases; deals solely with those clinical and pathological processes arising from a single blow, stress, or injury, such as occurs when a workman falls, or is struck or hurts himself; no attempt is made to deal with the clinical handling of injury in any stage." *Cloth, 5x7¼. 190 pp. $2.25.*

LEA & FEBIGER, 600 S. Washington Square, Philadelphia, Pa., are publishers of the following recent books:

INDUSTRIAL HEALTH SERVICE, by Leverett Dale Bristol, M.D., Dr. P. H., (Health Director, American Telephone and Telegraph Company; formerly Commissioner of Health of the State of Maine, and Professor of Preventive Medicine and Public Health, University of Minnesota.) "To present the more important facts and problems of industrial health from the standpoint of the employer and the supervisor as well as from that of the worker; endeavors to point the way to a well-rounded industrial health program for management representatives, executives, personnel directors, medical directors and all actively engaged in the organization, administration and appraisal of health service in industry." *12mo, 170 pp. Cloth, $2.00 net.* Published, 1933.

INFECTIONS OF THE HAND, by Allen B. Kanavel, M.D., Sc.D. (Professor of Surgery, Northwestern University Medical School; Attending Surgeon, Wesley Memorial and Passavant Memorial Hospitals, Chicago.) A guide to the surgical treatment of acute and chronic suppurative processes in the fingers, hand and forearm. *Sixth edition. Pub. 1933. Octavo, 552 pp. Cloth, $6.00 net.*

ACCIDENTAL INJURIES, by Henry H. Kessler, A.B., M.D., F.A.C.S., F.A.P.H.A. (Medical Director, New Jersey Rehabilitation Clinic; Formerly Medical Advisor, New Jersey Workmen's Compensation Bureau; Chairman of the Committee on Standard Practices in Compensation for Occupational Disease, and Chairman of the Subcommittee on Standards of Diagnosis and Prognosis of Lead Poisoning, American Public Health Association; Member of the Society of Medical Jurisprudence; Medical Director of the Occupational Disease Clinic in New Jersey Department of Labor.) The medico-legal aspects of workmen's compensation and public liability. *Octavo, 718 pp., 157 illus. Cloth $10.00 net.*

CUMULATIVE INDEX

Vol. 3—No. 1, January, 1934, pp. 1 to 60
Accidents and Carbon Monoxide, by Max Trumper, Ph.D. 23
Cardiovascular Disease and Industry, by Nathan Smith Davis, III, A.B., M.D., F.A.C.P. 14
Compensation for Loss of Remaining Eye 30
Dust Problems in the Pottery Industry 13
Editorials:
Experimental Research on New Organic Vapors 45
Getting Personal 47
Industrial Plant Surveys 47
Interpretation of Chest Roentgenograms 45
The Health of Workers in a Textile Plant 48
The Industrial Physician 44
Vascular Effects of Lead Poisoning 46
Where Individualism Persists 46
Group Medical Service Plans, by Roy W. Kelly 17
Industrial Physician, The, by C. O. Sappington, M.D., Dr.P.H. 1
Latent Syphilis Activated by Burn 24
Letters to the Editor:
"Talks on Industrial Medicine" 48
Medical Department Manual, The, by Hart E. Fisher, M.D., F.A.C.S. 7
Plaster Cast for Fractured Clavicle, by A. H. Hauber, M.D. 21
Two-Shift Employment of Women, by Ralph G. Mills, M.D. 25
Who's Who in I. M. & S.:
Volney S. Cheney, M.D., F.A.C.S. 39
Workmen's Compensation, by Thurman H. Lautenschlager, M.D., LL.B. 31

THE PRINCIPLE of selection for industrial employment is so fundamental that, when it is understood, it will be seen as tempering even the most complete socialization of industry dreamed of by the ultimate radical. For it is a principle, not of ownership of property, but of *use* of property regardless of who owns it. The individual, the corporation, the state, all have the same duty, of safe and proper use. Because of this duty the pre-hiring elimination of the subnormal, the unintelligent, the *problem* human being, who, for physical or mental reasons, or both, is likely to be accident prone, wasteful, dangerous, inefficient, unsatisfactory, is not an expression of the selfishness of private ownership; it is, instead, the necessity of all ownership. No one will believe that socialized industry would put a color-blind engineer in a locomotive cab, or a man with "tunnel vision" in the driver's seat of a passenger bus. If the U. S. S. R. has really a socialized government, does it let just anybody pilot its military planes? No more is the post-hiring study—by examination, diagnosis and treatment for mental, temperamental, emotional, personal, maladjustment as well as for physical unfitness—an expression of anything else than the same elemental necessity. Such things are an enforced answer to the individual's own neglect or ignorance of his individual duty to keep himself mentally and physically sound, in so far as possible. The common law doctrine of fellow servant, rooted in the crystallized customs of centuries, is a recognition of this surviving even the limitations which state necessity or policy have thus far imposed. *Selection*—prior or subsequent to hiring—is, therefore, a very considerable part of the field of practice of the physician in industry. The elimination of those who can't or won't, the training of those who can and will, —these are included in the broad challenge to medical science which industrial medicine holds forth. And if, in his study, the industrial physician avails himself of the help that the psychologists can give, so much the better. But, as Richard S. Uhrbrock points out in his "Importance of Psychology" (p. 61): "He (the industrial psychologist) needs the sympathetic cooperation of the physician and the psychiatrist. He should not attempt to usurp their functions." Mr. Uhrbrock quotes Albert P. Weiss and Alvh R. Lauer regarding psychological principles in automotive driving. The current *Atlantic* has an article, "Are You Safe to Drive," which interestingly describes the tests in this connection made by Dr. Lauer at his "clinic" at Iowa State College, where he is Associate Professor of Psychology. Mr. Uhrbrock also quotes Slocombe and Bingham: "Differences in ability to operate a street car or motor bus with safety were found to correspond with differences not only in training and in length of experience, but also in physical condition as indicated by blood pressure, and in skill in saving electric power as measured by automatic coasting records." Dr. Hart E. Fisher (p. 108) is doing some work of his own along the same lines, with emphasis on the medical and statistical bases of his conclusions. His findings are to appear in *Industrial Medicine* • • • DR. FISHER's "Medical Department Manual" (p. 97) will reach Sec. VIII, on Forms, with our April issue. There are more than 30 pages of forms; needless to say their assembly is *complete*. Following its serial publication here, the Medical Department Manual will be available as a book • • • DR. GEO. G. DAVIS, whose "Dislocation of the Patella" begins on p. 73, is one of the authors of "Pneumonokoniosis (Silicosis), Bibliography & Laws," the pre-publication announcement of which appears on p. 112 • • • THE HERNIA problem as an industrial accident remains one of constant interest and uncertainty to both surgeons and industrial boards," summarizes Dr. Robert M. Toll (p. 76) • • • DR. E. B. MUMFORD's "Derangement of the Semilunar Cartilage of the Knee" is another real medical article • • • So, TOO, is Dr. Nathan Smith Davis' study of "Cardiovascular Disease and Industry," the last sections of which begin on p. 83. Encouraging to the embattled survivors of the last four years who now see better times ahead is Dr. Davis' statement: "Mental strain, physical strain and hard work mental or physical rarely, except as mentioned above, cause the onset of heart failure. They certainly do not cause heart disease • • • A NEW DEPARTMENT, "Industrial Physicians and Surgeons," begins this month (p. 129). It is our department of *personal* mention. Nothing, in any field, has more vitality of interest than this kind of news. Such things as the little item about what Prof. Pikin says of Dr. Carey P. McCord are, to an editor, the very "spice of life" • • • The "Operation (in Great Britain) of Laws Providing Benefits in Case of Injury, Sickness, Old Age and Death," is a study from *International Labour Review*, London • • • The question *What Is Industry?* asked in "Significances and Coincidences," on p. 111, is food for thought. At what point does *industry* stop short of covering *all* employment? What kind of exchange of services for pay and pay for services *isn't* industry, in any real sense of the term? • • • A pregnant sentence is that one in the editorial "Can't Collectivize Medicine!" on p. 117 which says: "The tradition, the ethics, and the fact of the privileged nature of communications between company employee and company doctor throw the importance of industrial medicine into high relief against the background of the collective trend of every other aspect of the working relation" • • • THE PROBLEM PAGE this month discusses "Carbon Bisulphide Poisoning," saying, among other things, that its prevention is "fairly easy" • • • DR. LAUTENSCHLAGER's instalment of the Workmen's Compensation series deals with "The Diagnosis • • • INDUSTRIAL MEDICINE DIGEST is catching up. Soon it will reflect the *current* articles of special interest in the field of industrial medical practice • • • MANY YEARS AGO, in 1908, an engineering magazine then published in Chicago, undertook to get *every one* in its own special field as a subscriber. To that end it "followed up" its subscription circulars. One reluctant prospect finally answered, from South Africa, as follows: "Plagues of mosquitoes, bugs and roaches can be exterminated, but the American trade pusher is indestructible. Send along your magazine and give to us peace in our time, O Lord." The "American trade pusher" is more than indestructible. His energy, resourcefulness and persistence have, in no small measure, *made* America. The late depression may have subdued him in some visible respects, but behind the scenes he has been inventing, developing, improving—getting where he now is: *ready*. Hence, on p. 132, our new manufacturers' department headed WRITE FOR DETAILED INFORMATION — which we hope our readers will do.

Last Page